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THE

PATHOLOGY AND TREATMENT

OF

STRICTURE OF THE URETHRA.

THE JACKSONIAN PRIZE FOR THE YEAR 1852.

BY THE SAME AUTHOR.

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THE

PATHOLOGY AND TREATMENT

OF

STRICTURE OF THE URETHRA,

AND

URINARY FISTULÆ.

BY

HENRY THOMPSON, F.R.C.S., M.B., LOND.,

ASSISTANT SURGEON TO UNIVERSITY COLLEGE HOSPITAL; CONSULTING SURGEON TO THE ST. MARYLEBONE INFIRMARY, ETC., ETC.

> "THERE is one observation for which this appears to be the appropriate place. It is this,—that no single species of treatment ought to be vaunted as the one exclusively appropriate method . . . . no one can be successfully applied to all the varieties of the complaint. We cannot possess too many resources: we shall be unwise to deny ourselves the right to select, with discrimination, for each case its appropriate remedy. Such is the lesson which, I believe, is learned," &c., &c.—P. 300.

SECOND EDITION, MUCH ENLARGED AND REVISED.

LONDON:
JOHN CHURCHILL, NEW BURLINGTON STREET.
MDCCCLVIII.

Μέγα δὲ μέρος τῆς τέχνης τὸ δύνασθαι σκοπεῖν.

Hipp. Epid. III.

F47
1858

TO

JAMES MONCRIEFF ARNOTT, F.R.S.,

LATE PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS,

FORMERLY

PROFESSOR OF SURGERY IN THE UNIVERSITY COLLEGE, AND SURGEON
TO THE HOSPITAL,

This Work is Dedicated;

IN

ADMIRATION OF HIS PRACTICAL SKILL, SOUND JUDGMENT,
AND HIGH MORAL WORTH,

AND AS

A TRIBUTE OF GRATEFUL ACKNOWLEDGMENT FOR EARLY KINDNESS
AND VALUABLE INSTRUCTION,

BY HIS

OBLIGED FRIEND AND FORMER PUPIL,

HENRY THOMPSON.

59979

PREFACE TO THE FIRST EDITION.

THE following work consists of the Treatise to which the Jacksonian Prize, for the year 1852, has recently been awarded by the Council of the Royal College of Surgeons of England.

The subject named by the Council, and announced for public competition in the Summer of 1851, was, "The Pathology and Treatment of Stricture of the Urethra."

From these terms it may be inferred that a comprehensive view of the various important lesions commonly understood to be included under the denomination of STRICTURE, as well as of others which are intimately related to them, was required by the Council.

In the following attempt to execute a task of such magnitude and extent, the Author is painfully conscious of the degree to which he has come short of its accomplishment. The subject is one which embraces very wide and important relations. The possession of manual dexterity, and a practical familiarity with the best mechanical appliances on the part of the surgeon, are absolutely indispensable to the successful treatment of Stricture; but these alone constitute only a part of the agency which must be brought to bear upon a large proportion of the cases which he meets with in practice. An acquaintance with the pathology of the entire genito-urinary system is necessary, and must be patiently and assiduously cultivated. The numerous sympathetic relations with every part of the animal economy which this important part of it sustains, through the medium of the nervous system, have constantly to be recognised and apprehended. To enter fully on the consideration of these topics would require, not one volume, but several. A brief review of those which are to be regarded as possessed of primary importance could only be attempted within the limits of this work. On these grounds, therefore, no apology appears to be necessary on the Author's part, for offering so large a volume to the notice of his professional brethren.

It may be desirable, very briefly, to denote the plan which has been adopted in the arrangement of the materials which constitute the work.

Firstly:—The observations and opinions of those writers who have paid especial attention to the subject, are, on most points, collated and adduced. In each case the writer's words are quoted, and direct reference is made to the page and edition of his book.

Secondly:—Original researches have been made, as far as it has been within the Author's means to do so, and their results are compared with the foregoing. Thus, the Chapter on the Pathological Anatomy of Stricture is mainly a digest of the facts now exhibited in the principal Museums belonging to the Medical Schools of London, Edinburgh, and Paris, in which each preparation has been individually examined by himself. A reference is made in the text to various specimens of importance, and an account of these is placed in the Appendix, the bulk of which is thus somewhat increased, rather, however, for the purpose of facilitating the student's acquaintance with unquestionable examples and illustrations of the facts stated, than to furnish a body of matter possessing general interest and value.

Thirdly:—In relation to the natural history, and to the treatment of Stricture, a certain number of cases, hitherto unpublished, have been placed in the Appendix, under the head of "REPORTED CASES," for the purpose of illustrating numerous points connected with these divisions of the subject. Following these is a "TABLE OF CASES," 220 in number, each containing a very brief statement of the chief incidents in the history of the patient, and his present condition, condensed from fully-reported cases only, upon the aggregate of which have been founded, in a great measure, the Chapters on "The Symptoms," and on "The Causes of Stricture."

It has been deemed necessary to discuss somewhat at length the "quæstio vexata" of the present day, viz. that of cutting operations for Stricture performed from the perineum. Certain data required for this purpose will be found under the head of "OUTLINES OF CASES," which are merely very short histories, containing the principal facts bearing upon this question.

Lastly:—Respecting the anatomical relations of the normal as well as of the diseased urethra, no pains have been spared in order to develope the best practical mode of conveying, as far as this can be done on paper, sound information upon this important subject. It will be seen that a great number of bodies have been examined to supply the facts related. One, out of several illustrative preparations which were sent into the College of Surgeons with the Essay, contained portions of the corpus spongiosum from not less than twelve bodies, to illustrate a point in its anatomy referred to at pages 36–38.

The Author has now only to present his grateful acknowledgments to the Council of University College, London, for permission freely granted in any way to make use of the valuable Case-books of the late Mr. Liston;—to Mr. Erichsen, the esteemed Professor of Surgery in the College, for liberty to examine and publish the cases of any patients under his care in the hospital, which might illustrate the subject;—to those gentlemen who have readily assisted him in the pursuit of information respecting patients formerly under their care, among whom he is especially bound to name Mr. Syme, who has also afforded him every facility for observing his practice, both public and private; Mr. Fergusson, Mr. Cock, and Mr. Coulson, besides numerous others in various parts of the country, who have most promptly responded to his inquiries; and, lastly, to his old friend and formerly fellow-student, Mr. Squire, late surgeon to the St. Marylebone Infirmary, for the invaluable opportunities he has at all times afforded him of prosecuting practical researches at that institution.

16, *Wimpole Street, Cavendish Square,*
December, 1853.

PREFACE TO THE SECOND EDITION.

THE first edition of this work being published as a Jacksonian Prize Essay, it was not possible to alter or add to the manuscript originally sent to the College of Surgeons.

But a new edition having been called for, the Author has determined to make considerable additions, and to rewrite several portions of the work, for the purpose of embodying the results of increased observation and experience. Besides a few additions to the first two chapters, rendered necessary by the result of recent investigations, the chief alterations may be briefly indicated as follows:—

Firstly:—The Chapter on "Dilatation" is considerably extended, chiefly in relation to the practical management of patients submitted to the numerous varieties of treatment which claim to be considered under this head.

Secondly:—Much new matter is added to the Chapter on "Internal Incisions," for the purpose of illustrating a mode of practice which has proved, beyond doubt, to be extremely valuable in certain cases, as well as of indicating those to which it is especially applicable.

Thirdly:—A large part of the Chapter on operations by "External Incisions" is rewritten. The increased experience which has accrued since the date of the first edition, and the modifications in practice it has suggested, rendered this necessary. Very extended data, consisting of almost the entire English experience of the last ten years, have been collected with much care and labour, in order to present the reader with the means of arriving at an accurate estimate of the operation of External Division.

Fourthly:—The subject of "Fistulæ," including that of "Plastic Operations on the Urethra," is treated at length; this portion of the work is almost entirely new.

Fifthly:—The following are minor changes: Illustrative Cases, which originally occupied the Appendix, are now placed in the text; each chapter being immediately followed by those appropriate to its own topic. Many of these examples also are new, the Author having substituted cases which have been under his own observation for those which in the first edition were reported from the practice of others. Many inaccurate statements having been made in relation to the origin of our present modes of treatment, an attempt has been made to render more complete the historical portion of the subject in each department. Numerous woodcuts have also been added.

In conclusion the Author desires to offer his very grateful acknowledgments, first, for the extremely flattering reception which the original edition met with from his professional brethren. Several of the suggestions for its improvement, offered in various critical notices, appeared to be valuable, and have been carried out. If permitted to particularize, he must confess that, after all, the most flattering appreciation of his labours was that which appeared in the appropriation of thirty pages of the second chapter, without acknowledgment, and their literal translation into the French, by a foreign surgeon, as "his own proper observations." The "réchauffée," so produced, was received as an original paper by the "Société de Chirurgie" of Paris, in 1856, and has been published and favourably reviewed in the neighbouring capital as the work of the individual who placed his name on the title-page. It would be impossible for the Author to omit this opportunity of presenting his sincere and cordial thanks to the Press of this country, of France, and of America (in the latter the fraud was first discovered and exposed), for the prompt and complete manner in which it hastened to lay bare and publish to the world the fraud in question. To the "Société de Chirurgie" of Paris, he next begs to offer a public expression of his gratitude, for the prompt and generous manner in which it denounced the plagiarism, accorded more than justice to the original Author, and gave the utmost publicity to its unanimous resolutions on the subject. To the "Société Anatomique" of Paris, it is also his pleasing duty to render similar homage.

Lastly, the Author desires to express a grateful sense of his obligations to numerous professional brethren, chiefly hospital surgeons of this country, metropolitan and provincial, who, to his inquiries respecting the subject of the Ninth Chapter, have fully responded, in many cases at no mean sacrifice of time and labour, and have placed at his disposal extremely valuable experience, which in no other manner could have been presented to the profession, as evidence on a question hitherto much obscured by the incomplete statements to which generalization from insufficient data has given birth.

16, *Wimpole Street, Cavendish Square,*
Sept. 7, 1858.

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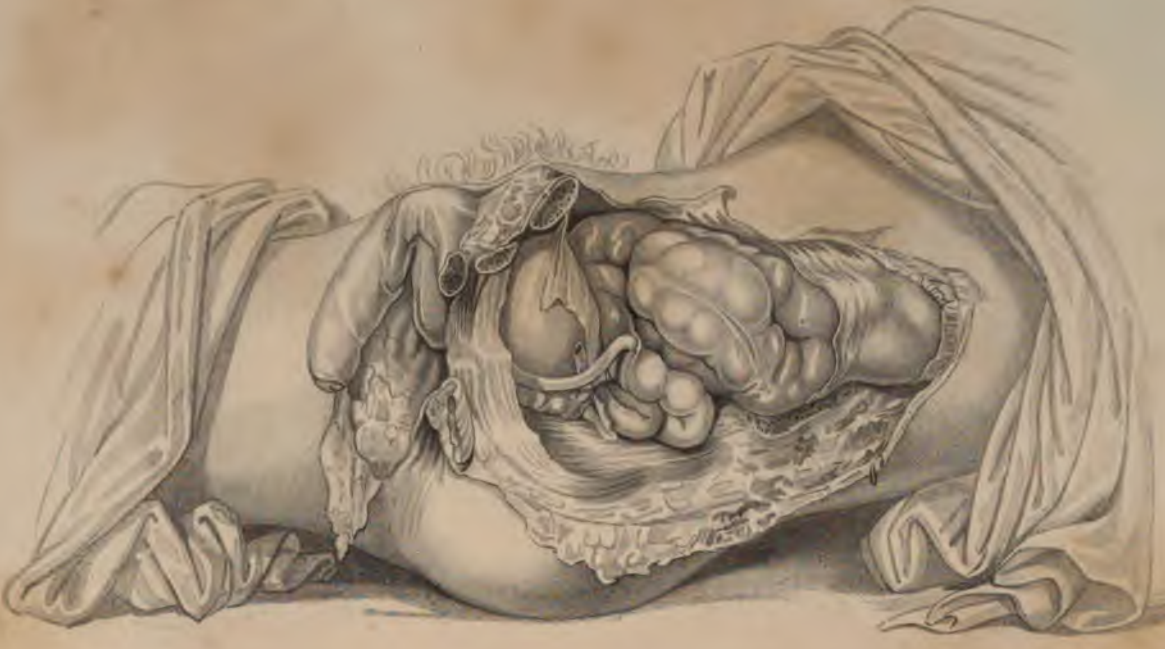
PLATE 7.



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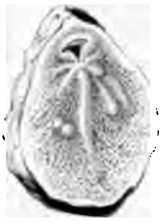

DESCRIPTION OF ENGRAVINGS.

PLATE I.

THIS drawing was made from a dissection of the pelvic viscera from the side, in the manner described at page 40. The measurements of every part were accurately made and preserved by the artist. The rectum and anus were maintained very nearly in position, after the division of the levator ani (a portion of which may be seen turned downwards) by a loop or two of thread. The division of the pubic bones being made nearly two inches to the left of the symphysis, a section of both rami is seen. Beneath the lower ramus is the divided corpus cavernosum of the left side. Behind the bulb of the corpus spongiosum are seen muscles, situated between the two layers of the deep perineal fascia, and behind these is the fascia (recto-vesical) which supports the prostate, bladder, and rectum. The bladder itself was not stuffed, or otherwise interfered with, but left in its natural relations; it contained, as was afterwards ascertained, 14 ounces of urine. It has fallen downwards a little from the natural position, and is seen to be partially covered with its peritoneal envelope. The outline of the sacrum and coccyx may be traced beneath the rectum.

PLATE II.

Sections of the Corpus Spongiosum Urethræ, made at different distances from its posterior extremity, but all within the limit of the bulbous portion; a median fibrous partition is seen in two. In the lowest figure, in which the section was made farther back than in the former, two or three intersections appear. (See pp. 36, 37.)

DESCRIPTION OF ENGRAVINGS.

PLATE III.

SEE PAGE 389 IN APPENDIX.

Microscopical appearances of Urinary Deposits.

FIG. 1.—Uric acid, in its chief varieties of form and appearance, as occurring in the urine.

2.—Urates of soda or ammonia.

Oxalates of lime.

3.—Phosphates of ammonia and magnesia.

Phosphate of lime.

PLATE IV.

SEE PAGE 390 IN APPENDIX.

FIG. 1.—Pus corpuscles.

Ditto, after the application of acetic acid.

2.—Blood corpuscles, natural; after immersion in urine. Epithelium. Exudation corpuscles.

3.—Urinary casts.

CHAPTER I.

THE ANATOMY AND PHYSIOLOGY OF THE MALE URETHRA.

Method of pursuing the inquiry—Anatomical relations of the urethra proper—Length of the urethra—Mode of taking measurements in the dead body—Measurements in the living subject—Length varies greatly during life—Measurements of width—Relative and not actual width of certain parts important—Dilatability; casts of the urethra—Sir E. Home's observations—Mr. Guthrie's—Anatomical divisions of the urethra—The Prostatic part—The Membranous part—The Spongy part—The "Bulbous portion"—Mucous membrane of the urethra—Glands; rugæ; transverse sections—Vessels and nerves—The deep fasciæ of the perineum—The muscular tissues; involuntary muscular fibre—Hunter's views of the muscularity of the urethra—Home's researches—Kölliker's researches—Mr. Hancock's—Directions for demonstrating the involuntary muscular fibres—Investigations by Professor Ellis—The voluntary muscles which act upon the urethra—Levator ani—Compressor urethræ—Mr. Wilson's account—Mr. Guthrie's description—Müller's description—Santorini's drawings—Accelerator urinæ—Erector penis and transversus perinei—Functions of the muscles described—Statements respecting the act of micturition—Conclusion—Statements respecting the act of seminal emission—Contrast between the acts of micturition and seminal emission—Conclusion—Two sources of muscular action upon the urethra—Function of the neck of the bladder—Sphincteric function of the compressor urethræ—The acts of defæcation and micturition closely related—Function of the levator prostatæ—Erectile tissue—Internal structure of the corpus spongiosum at the bulb—Relation of the bulb to the surface of the perineum, rectum, &c.—Dissection to show it—Structure of the bulb in relation to hæmorrhage—Direction of the urethra—Of the spongy portion—Of the membranous and prostatic portions—Practical inferences—The lowest part of the canal—Relations of the fasciæ—The urethral curve—Variations from the normal direction—Enlarged prostate—The urethra in boys—Straight instruments may be used—Résumé of the whole chapter in the form of propositions.

It will be essentially necessary, in order to understand fully and clearly the subject of this essay, in its numerous and important relations, first, to study closely the anatomy of the healthy male urethra, and inquire into its physiological action and uses. In doing so, I shall collect and review the labours of those distinguished observers who have hitherto devoted their attention to the work, and compare them with the results of those investigations which I have myself been able to make, by repeated dissections, and researches into cer-

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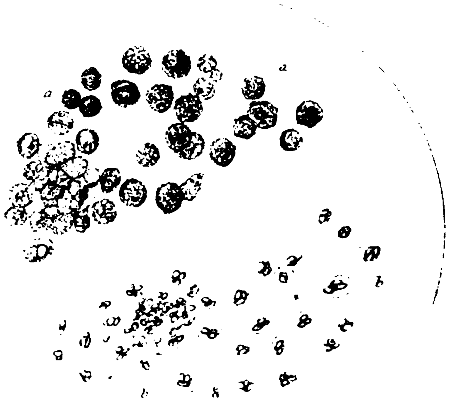

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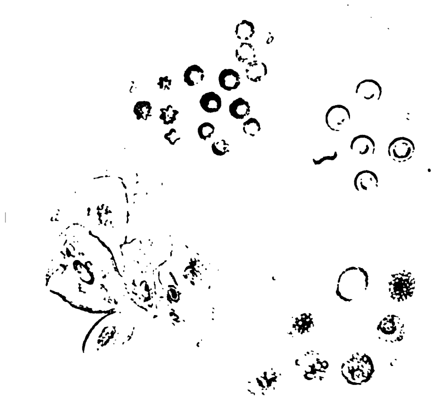

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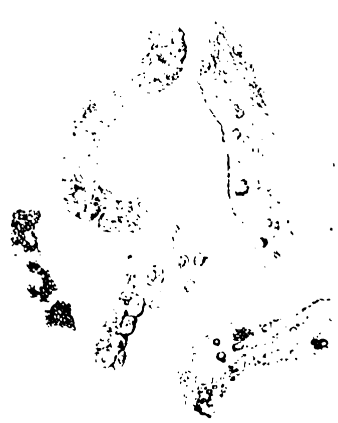

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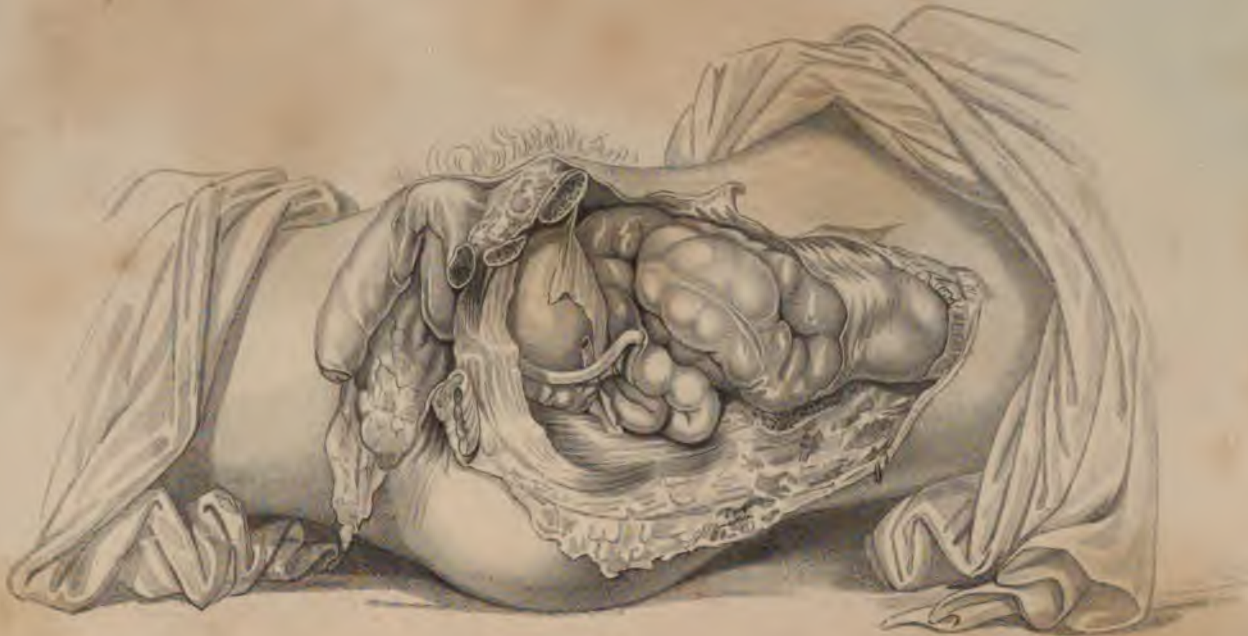
PLATE 7.



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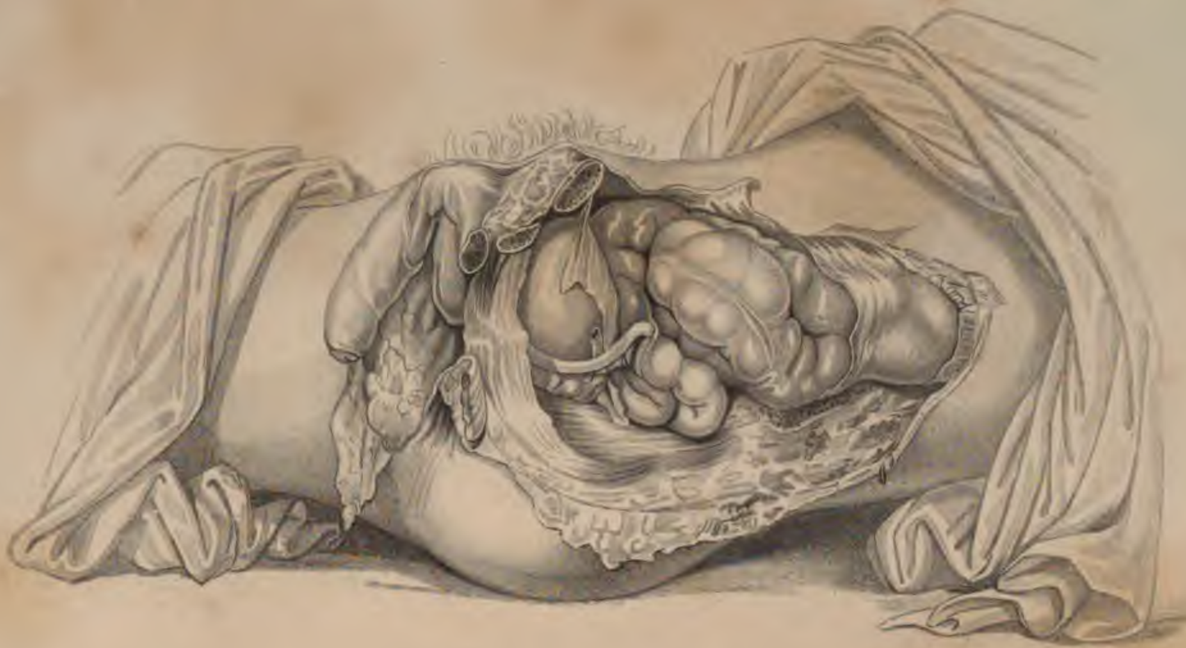

H. B. Tuson, del

tain conditions of the organ, which are illustrated in the tables and drawings accompanying this volume.

It will be unnecessary to adduce any reasons in support of this mode of proceeding. The study of anatomical and physiological science is too generally admitted as the only sound basis on which to conduct intelligent researches into the meaning of pathological phenomena, as a general principle, to admit of the adoption of any other course. But in the particular case before us, of the Pathology of Stricture of the Urethra, none who have paid any attention to it will deny, that it is especially essential, in order to arrive at truth, in relation to many disputed points in the pathology of this very complex organ, to obtain all the light on its structure and functions, which dissection of the healthy part, and observation of its healthy actions, can afford. I say "complex organ," because, although the urethra, strictly speaking, is a canal merely, and comprehends no more, as the term itself implies,* yet, as it is so intimately connected with certain muscular and other tissues, which together constitute the surrounding structure, and, as we shall hereafter see, is so greatly affected through the medium of their influence, much more than the canal itself is necessarily presented for our consideration.

We shall accordingly examine, first, the urethra proper; and, secondly, the neighbouring parts which can exercise any influence, mechanically or vitally, upon its form and condition.

1. THE URETHRA PROPER.—This term applies to the canal which leads from the urinary bladder to the external orifice, *meatus urinarius*, at the extremity of the penis, in the male, or within the vulva in the female. It may be regarded as made up of a mucous membrane, and certain tissues adjacent, which, for the present, may be included under the general term, "submucous," and the nature of which shall be presently examined. The length of the urethra in the adult male has been differently stated, for it varies considerably in different subjects, as it does also in the same individual, under different circumstances, since the parts are exceedingly extensible, and may be readily made to correspond to any given measurement. These sources of difference are sufficiently obvious to the anatomist, and forcibly prove the necessity of following some constant method, in the examination of each urethra, if accurate results are to be attained.

Accordingly, with a view to the solution of this question, I have pursued the following course, with a considerable number of bodies, which it has fallen to my lot to examine. The penis and bladder having been carefully removed from the pelvis, in the usual manner, the entire passage is laid open along the upper aspect. The parts are then placed, being first moderately extended, upon some smooth polished surface, as on a common earthenware dish, and so permitted to take, by their own elasticity, any form or length which their component structures may determine. The measuring tape is then applied. The average result of the application of this process to 16 adult bodies is as follows:—

---

* URETHRA, from ουρον, urine, and τρεχω, to run.

TOTAL LENGTH, from anterior border of uvula vesicæ to meatus urinarius externus	8½ inches.
Dividing the canal in the usual manner into spongy, membranous, and prostatic portions, we have—	
Length of *spongy portion*	6½ ,,
,, *membranous* ditto	¾ ,,
,, *prostatic* ditto	1¼ ,,
	8½

The greatest measurement was 9 inches, the smallest 7¾ inches. Of the 16, no less than 10 presented measurements which did not deviate more than a quarter of an inch from the average, and ranging within ⅜ths of an inch only; that is to say, between 8¼ and 8⅝ inches inclusive.

Mr. Briggs, formerly of the Lock Hospital, has made some investigations into the subject, which came to my knowledge since many of the post-mortem measurements just recorded had been ascertained. His experiments were made upon the living subject; and, inasmuch as the practical benefit of these researches must be found in relation to the use of instruments during life, it is confessedly of more importance to ascertain, if possible, the length of the canal in that condition, than after death. He states, that the average length of the urethra is about 7½ to 7¾ inches. I have, therefore, embraced opportunities of testing his method, and this in very many instances, and believe his observations to have been in the main correct.*

---

* Mr. Briggs, late of the Lock Hospital, published the results of a series of experiments made upon a number of persons during life, with a view to arrive at conclusions respecting the normal length of the urethra. His measurements were taken by means of a graduated catheter passed into the bladder. He estimated "the average length of the urethra to be 7½ to 7¾ inches."—*Treatment of Strictures by Mechanical Dilatation.* London, 1845, p. 9.

Again he says:—"In a plaster cast of a vertical section of the male pelvis, I find the

It will therefore be borne in mind, that these two measurements of 7½ inches and of 8½ inches, respectively, relate to the average length of the urethra in the two conditions of life and death. That this difference exists it will be particularly important to recollect, since all accurate researches into the pathological anatomy of stricture are, of necessity, confined to an observation of the parts *after death*, while, in relation to treatment, the measurement *during life* is that which alone must be remembered.

But it will be very obvious that, during life, the length of the urethra in the same individual greatly varies with its vascular condition. Erection considerably increases it, and it is, of course, the opposite condition, or that of flaccidity, which is denoted in the estimates given. But in different individuals, as with all other organs of the body, these, in particular, appear to vary in size somewhat, especially to the superficial observer. Still there is reason to believe that less difference really exists than is generally imagined. I confess to have been formerly somewhat surprised to observe how much alike organs, which appeared to differ greatly in the matter of size while attached to the body, became, when slit up and laid open throughout their whole extent, with the bladder connected; a result which is due to

---

following to be the proportion of the several parts of the urethra. From the orifice to the membranous part, 6½ inches. From thence to the bladder, 1¾ inches. Total, 8¼ inches."—*Ibid.* pp. 11, 12.

Mr. Whateley examined 48 subjects of different statures, and found the average length to be 8½ inches. "In each of these classes there were some differences in size, and in many of them considerable variations in the length of the projecting part of the penis. The number of tall men was 16. Of these the following is an exact measurement of the different distances rom the extremity of the penis to the bladder in each of them, taken while the former was held firmly on the catheter to prevent it from shrinking.

Sixteen tall men.	Twenty-three of middle stature.	Nine short.
1 at 10 inches	3 at 9½ inches	1 at 9¼ inches.
8 at 9½ ,,	1 at 9¼ ,,	2 at 9 ,,
5 at 9 ,,	7 at 9 ,,	4 at 8½ ,,
2 at 8½ ,,	2 at 8¾ ,,	2 at 8¼ ,,
	7 at 8½ ,,	
	2 at 8¼ ,,	
	1 at 8 ,,	
16	23	9"

—*Improved Method of Treating Strictures.* London, 3rd edition, 1816, pp. 68–9, in a note.

Mr. Benjamin Phillips says:—"The experiments I have made by injecting the erectile tissue composing the corpora cavernosa decidedly confirm the accuracy of Whateley's calculations, and justify me in stating the average length of the urethra as varying from eight to nine inches."—*Treatise on the Urethra.* London, 1832, p. 2.

the fact, that considerable variation exists in the relative amount of the organ which remains pendant and unsupported, as compared with the part which is fixed and attached, in different individuals, and so partially concealed from the eye, the two bearing an inverse proportion to each other; or, at all events, where the length of the organ appears to be remarkable, the difference is often mainly to be accounted for by the greater development of the pendant portion, and is far less observable in the remaining part; the amount of the former, sometimes depending greatly upon normal peculiarity in the size and form of the scrotum (just as in disease we sometimes find the penis almost hidden by a scrotal hernia, or a large hydrocele); also in some small degree upon the distance beneath the symphysis pubis, at which different urethras emerge from the pelvis, some not dipping down so deeply beneath the arch as others, by three-eighths of an inch, and so making a smaller and a shorter curve than the latter. This fact will be more fully noticed hereafter. Nevertheless, canals differing considerably in length may be found in health, while unusual length may be a sequence of disease, as seen in cases of enlarged prostate; but setting these aside, a range of between eight and nine inches will include a very large proportion of the whole number, all being treated in the manner above described. It is easy to account for the discrepancies which appear, in comparing the measurements of different observers, when it is remembered that the urethra of eight and a half inches may easily be stretched into ten. The same remark will hold good with reference to the relative length of the different divisions, no very obvious or defined mark existing in the urethra to determine any lines of demarcation between them, notwithstanding which their measurements are calculated with so much nicety, as very frequently to be expressed in lines. Next, as to the width of the passage. This it is exceeding difficult to reduce to figures, from its natural dilatability in the healthy condition. Anatomists have stated three, four, and five lines, as approximative measurements. Surgeons have recorded the passage of calculi through it of three and a half to four lines in diameter, which must of course indicate the amount of *extensibility* enjoyed by the *narrowest* portions of the canal. The mucous membrane after death, when treated in the manner already described, is accordingly found lying in long, but minute and narrow folds, which are readily obliterated by stretching it in a transverse direction, when laid open, to about double its natural width. In this condition, but unstretched, we obtain measurements as follows; and these, it will be remembered, although denoting the circumference, represent about half what it really amounts to when the passage is ordinarily dilated.

The neck of the bladder, or commencement of the prostatic portion, measured	$\frac{5}{10}$ to $\frac{6}{10}$ inch.
The centre of the prostatic portion	$\frac{7}{10}$
Beginning of membranous, or end of prostatic portion	$\frac{5}{10}$ to $\frac{6}{10}$
Middle of membranous part	$\frac{6}{10}$
End of ditto, close to the bulb	$\frac{5}{10}$
Bulbous part of spongy portion	$\frac{7}{10}$
The part within the glans	$\frac{6}{10}$
Meatus externus	$\frac{5}{10}$

Thus it will appear that, relatively to each other, different parts of the canal bear certain constant proportions. For example, the external meatus itself is the smallest, except when, as very rarely happens, a congenital contraction exists about a quarter or half an inch from the extremity, and of course within view; next is the point of junction between the membranous portion and the bulb; while the centre of the prostatic portion, and the sinus of the bulb, are the largest.

After all, it is the *relative*, rather than the *actual*, size of the various parts of the passage, which is of the greatest consequence to the practical surgeon, and the foregoing measurements may be most advantageously viewed, as possessing relative rather than absolute value. Again, in the living body, the walls of the passage are closely applied to each other in a state of inaction, so that the diameter is only calculable when distension occurs from some cause; and as this has been seen to correspond, within certain limits, to the amount of pressure exerted upon them, any statement respecting it must be liable to some modification. Indeed, the question of the diameter of the urethra must be considered as resolving itself, to a certain extent, into *the measure of its capability of being extended*, and this is of greater practical import than the mere width of its mucous membrane, when slit up after death.

One of the best modes of determining extensibility, is the formation of casts of the urethra by means of injections of wax, or, better still, of fusible metal. The former have been frequently employed; among others, by Sir Everard Home, who paid considerable attention to this subject, and he gives the result of experiments on two bodies, one of eighty, and the other of thirty years of age; the measurements recorded being those of the diameters of the cast, at different parts of its course.*

"THE DIAMETER OF THE CASTS OF THE URETHRA IN DIFFERENT PARTS.

	YEARS.	
	80	30
At ¾ inch from the external orifice	$\frac{9}{20}$ inch.	$\frac{7\frac{1}{2}}{20}$ inch.
At 4½ inches from ditto	$\frac{7}{20}$	$\frac{7}{20}$
At the bulb, 7 inches from ditto	$\frac{13}{20}$	$\frac{13}{20}$
In the membranous part, 7½ inches from orifice	$\frac{7}{20}$	$\frac{4}{20}$*
In the membranous part, near to the prostate gland, 8¼ inches from orifice	$\frac{9}{20}$	$\frac{7}{20}$
Where the membranous part terminates and the prostate gland begins, 8½ inches from orifice	$\frac{7}{20}$	$\frac{6}{20}$
In the middle of the prostate, 8¾ inches from orifice	$\frac{11}{20}$	$\frac{10}{20}$
At the neck of the bladder, 9 inches from orifice	$\frac{9}{20}$	$\frac{8}{20}$

* "In this man there had been stricture at this part."

These casts were nine inches long, but Sir E. Home states, "that the canal, in the relaxed state, is eight and a half inches" long, which corresponds with my own measurements, taken in the manner described.†

The latter mode has been employed by the late Mr. Guthrie and Mr. Quekett, and drawings of two casts are exhibited in the reprint of a lecture given by the former gentleman, before the Medical Society of London, in April, 1851. They strongly exemplify the remark that this mode of examination affords, probably, the most accurate measure of the relative dilatability of the various parts of the canal to equable pressure.‡

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* Practical Observations on the Treatment of Strictures, &c., 1805. Vol. i. p.

† Respecting Sir E. Home's measurements given in the text, Mr. Phillips says:—"The observations I have made differ only from those of Home in making the diameter a little less considerable, whilst the relative diameter of the different parts was similar to that of the younger subject examined by him."—*Op. cit.* p. 4.

Lisfranc's measurements, or rather his estimate of the diameter of the urethra in twelve subjects examined, but confessedly not measured by him, are as follow:—

Commencement of the prostatic portion, next the bladder	3	to 4	lines.
Centre of ditto	4	to 5½	,,
End of ditto	3	to 4	,,
Beginning of membranous portion	4½	to 5	,,
End of ditto	3½	to 4½	,,
Behind or near to the bulb, *i.e.*, behind its dilatation"	3	to 3½	,,

‡ Vide a Lecture delivered before the Medical Society of London, April, 1851, by G. J. Guthrie, F.R.S.

The value of these researches is found in the practical application of the principles which result from them, to the employment of instruments in the urethra during life. Granted that constant relations of size, between the different parts of the canal, exist, and that the external meatus is known to be, with very few exceptions, the smallest of all; it follows, that an instrument which fills that orifice without over-stretching it, must be able to pass through its whole course, unless some obstruction be present. Thus, to some extent, it may be regarded as a key to the capacity of the rest of the canal. As regards the actual average of measurements met with in practice, it is seldom that No. 12 cannot be fairly introduced into the adult urethra, while Nos. 13 or 15 are often admissible. The diameters of these instruments are, respectively, three-tenths, and three and a half tenths of an inch.

We now come to the consideration of the anatomical divisions of the urethra, which have been used for facility of description, in relation to their external connections and internal conformation. They are three in number, viz., the PROSTATIC, the MEMBRANOUS, and the SPONGY portions.

The PROSTATIC PART will be at once understood to indicate that portion of the canal which traverses the prostate. Its length depends upon the size of this organ, and in health averages about an inch and a quarter.* Its width is more constant than that of any other part of the urethra, from the surrounding structure being less susceptible of *sudden* change in size; at the same time it is *much more dilatable;* while its upper part, close to the neck of the bladder, is more resistant and unyielding. At its commencement, immediately in front of the uvula vesicæ, which seems to fill up the internal urethral orifice in the ordinary or quiescent condition of the parts, when the urine is not flowing, it is about three or four lines

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[*] LENGTH OF THE PROSTATIC PORTION OF THE URETHRA.

Boyer regards it as varying between	15 and 18	lines.
Lisfranc ,, ,,	8 and 11	,,
Ducamp ,, ,,	12 and 15	,,
Phillips ,, ,,	12 and 15	,,

LENGTH OF THE MEMBRANOUS PORTION.

Boyer regards it as about	12	,,
Lisfranc regards it as varying between	7 and 11	,,
Ducamp regards it as about	9 or 10	,,

Phillips considers it as about "an inch in length superiorly; inferiorly about four or five lines."

broad, gradually widening to the centre, where it may be about five lines, and narrowing again to three or four, so that it has an ovoid form. Cut transversely, the section appears somewhat triangular, the apex being downwards. It passes through the upper part of the prostate, having generally the greater portion of the organ below it; although sometimes as much appears above as below.

On laying open the urethra here from above, we have the following structures in view. Commencing behind on the floor, continuous with the uvula vesicæ, just named as bounding its posterior limit, is seen a lightish-coloured, thin band of fibres, beneath the mucous membrane, in the form of a line running along the centre (see Fig. 6), until lost in an eminence, produced by a suddenly rising fold of the mucous membrane and subjacent tissues, prolonged forwards, as a ridge about eight or nine lines in length, and gradually diminishing till it becomes a band similar to that just described, which then fades as it passes on through the membranous into the bulbous portion. This eminence is the verumontanum, caput gallinaginis, or crista urethræ. Kobelt and others affirm that it contains erectile tissue, and may serve as a barrier to prevent the regurgitation of semen into the bladder in the venereal act.

In this crest, about a line or two anterior to its summit, may be seen (much more readily in some than in others) a slight depression, through which a small probe may pass into a sac, three or four lines deep, called the sinus pocularis, or utricle; named also, "vesica prostatica," by Weber. The common ejaculatory ducts are contained in its walls, one on each side, opening by a narrow slit on the border of its orifice. The prostatic sinuses of the urethra are formed by a depression on either side of the central ridge, and the prostatic ducts open into them by several minute orifices, in number not less than twenty or thirty, easily seen by squeezing the organ, when some brownish viscid liquid issues from them. It is quite possible that the point of a small catheter might be entangled in the sinus pocularis, just described, although it is improbable that such an accident should often happen. Nevertheless, as it might do so, especially under circumstances in which the sinus is apt to become unusually dilated, the fact deserves a passing notice.

The MEMBRANOUS PART was so called by the older anatomists from the supposed absence of any special surrounding body or substance coming into important relation with the membrane-like tube, which here forms the urethra. While the prostate gives its name to the first part, as we have seen, and the spongy erectile tissue is the origin of the term which denotes the third, the condition of the canal itself becomes in this case the source of the nomenclature employed. And it will still be used here, as perhaps, after all, the best, and certainly the best understood, although, adopting the principle which holds good in the other two parts, we might substitute with advantage *muscular** or *contractile*, for *membranous* portion. Not that contractility is absent in those, but that it is present especially in this, and constitutes, as we shall hereafter learn, the very important feature relating to this small division of the urethra.

Its length is generally rather over than understated, one inch, or nearly one inch, being commonly allotted to it; three quarters is nearer the truth for the upper part, and about half or five-eighths for the lower part or floor, a difference arising from the oblique direction backwards, which the erectile tissue, forming the bulb of the corpus spongiosum, takes, in passing from above downwards. Its posterior limit is formed by the apex of the prostate and posterior layer of the "deep perineal fascia" while the anterior layer of the same fascia corresponding with the termination of the bulb, and being continuous with its fibrous envelope, defines its anterior limit. So that the membranous portion may be regarded as the part which intervenes between these two layers of fascia,—in fact, the *inter-fascial* division of the urethra.

It is the narrowest division of the urethra, excepting only the meatus itself, and the colour of its mucous membrane is deeper in tint than that of the prostatic part; but an extension of the white line described in the last-named division is seen in this portion to be continued along the floor.

The SPONGY PORTION is that part of the urethra which is encircled by the erectile tissue of the corpus spongiosum, and comprehends all which is anterior to the division last described. It should be remarked that the erectile tissue entirely surrounds the canal throughout this portion, although the layer on the upper surface is thin. It is nevertheless very commonly represented as wanting on that aspect in diagrams, and even in published anatomical drawings of high reputation. Its length is much more variable than that of the other portions, being greatly increased by erection; its limit, therefore, may range between five and eight inches during life. It is of tolerably uniform width, except at its two extremities, a slight enlargement existing at the posterior one, called the "sinus of the bulb," belonging chiefly to its floor; and a sudden enlargement at the anterior part, in the glans, within an inch of the meatus, also occupying the inferior surface, called the "fossa navicularis Morgagnii." The first-mentioned enlargement is less obvious to the eye, on merely laying open the urethra, than the latter, which has led to a denial of its existence by some anatomists; the part is, however, much more *dilatable* here, and yields much more to injection, as already seen. The want of a clear discrimination between size and dilatability has led to this apparent discrepancy. On the floor of the sinus of the bulb, towards its centre, may be found, sometimes with some difficulty, or not at all, the two small mouths by which the ducts from Cowper's glands enter. These ducts may be often observed or traced running beneath the mucous membrane for a distance of half or three-quarters of an inch. Besides these, are several small lacunæ to be noticed presently. The meatus, as before stated, is the smallest part of the whole canal; some dense fibres being very clearly seen to lie transversely at the extreme end of the canal when opened, which are but very slightly elastic. This structure is described by Mr. Guthrie as resembling the border of the eyelid, and by Mr. Hancock as a circular disposition of muscular fibres. The direction of the meatus is vertical, and its form that of a narrow slit, about three lines long, the sides of which are formed by two lip-like portions of the surrounding glans penis, united by a commissure above and below; the latter is more strongly marked and connected with the "frænum preputii," so that in erection the meatus is drawn downwards to some extent.

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* The term "muscular" was suggested by Cuvier, to denote this portion.

It is very common to use the term "*bulbous portion*" for the purpose of designating the posterior part of this division of the urethra. Some writers, indeed, have recognised it as a distinct division; a practice which, as no marked anatomical indications exist to define its limits, it is not intended to follow. There will be an advantage, however, in adopting it, to save circumlocution, as applicable to the posterior inch, or thereabouts, of the spongy portion.

The mucous membrane of the whole urethra is continuous with that of the bladder, and also at the meatus with the integument of the glans. It is moreover prolonged into the prostatic and seminal ducts, and several small pouches or lacunæ, many of which occupy the floor, while others are found on the upper aspect of the passage, and their apertures, for the most part but not invariably, look towards its external orifice. The largest, "lacuna magna," is in the last-named situation, about an inch or inch and a half behind the meatus. Many of these lacunæ are from a third to two-fifths of an inch in length; they run obliquely under the mucous membrane, sometimes among the organic fibres subjacent. Their secretion appears to differ in no respect from common mucus. Besides these, the whole mucous membrane has numerous small follicles and mucous glands. Its epithelium is in part columnar, but chiefly spheroidal, and this gradually passes into the tessellated variety as it approaches the anterior end of the urethra. In the fresh subject its colour is a fine light pink, deeper at the last or external inch, and also in the membranous part and sinus of the bulb, shading off into light as it advances forwards. Behind these it has a yellowish tint, as it passes backwards into the bladder.

The whole surface described is constantly lubricated with mucus secreted by the glandular structures in its walls. It is also exceedingly vascular. Mention has been made of the rugous character of its mucous membrane. This condition applies to all that which is anterior to the prostatic portion, where no rugæ exist. In the membranous and bulbous parts they abound, more especially in the latter, where the membrane is disposed in longitudinal folds, in number from three or four to eight or nine, and here many small papillæ may be seen upon them. Towards the middle of the spongy portion they are much less developed, but they again become prominent in the neighbourhood of the glans. From their close lateral approximation to each other, under ordinary circumstances, the canal is closed, or nearly so, and presents an appearance, more or less stellate, on transverse section.* Nearer to the glans, however, the section is almost transverse in form.

The presence of these rugæ seems to be connected in some degree with the existence of numerous long and slender bands of fibrous tissue, which are seen lying immediately beneath the mucous membranes, for the most part in a longitudinal direction. I have frequently observed that these are larger and stronger at each extremity of the canal than in the intermediate part of its course; that is to say, in the prostatic portion and in the part which traverses the glans. In the bulbous and membranous portions they are numerous, but extremely delicate, constituting these the weakest parts of the urethral wall, a fact worthy of remembrance in connection with the use of instruments there. These bundles of fibres are formed largely of elastic tissue, associated with the connective areolar tissue, by which also they are bound together and united with the organic muscular fibres beneath the superjacent mucous membrane, and with numerous interlying minute blood-vessels. And along the roof of the canal throughout almost its whole course, but particularly well marked in the spongy region, exists a continuous band of associated fibres, nearly an eighth of an inch in breadth, which seems to strengthen the wall in this aspect. It can only be properly seen by slitting up the canal along its inferior border.

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* Guthrie, op. cit. p. 20. Figured also by Bauer in the Plates Nos. 1, 2, and 4, in the third volume of Sir E. Home's work on Stricture. 1821.

The vascularity of the membrane is rendered very obvious by the use of a fine injection, which gives a bright vermilion colour to it throughout. Mr. Quekett's injected preparations demonstrate vessels lying longitudinally, more particularly in the furrows, between the rugæ found in the bulbous portion; while nearer to the meatus, where rugæ can scarcely be said to exist, the membrane has somewhat of a villous character, and a looped capillary may be seen in each of these little prominences. Blood is supplied to the urethra through small branches from the "*artery to the bulb*," some of which pass through the substance of the corpus spongiosum to reach it, where they form plexuses beneath the basement membrane, and around the lacunæ and glandular crypts, communicating freely among themselves and at the meatus externus, with small branches of the dorsal artery of the penis. From all these parts it is returned in part by small branches which enter the veins of the bulb and of the cavernous bodies, to join the pudic vein, and in part by the dorsal vein of the penis, which receives a large portion by numerous offsets, and perforates the triangular ligament to join the prostatic plexus. This consists of large venous channels lying between the folds of fascia which envelope the prostate, chiefly along each lateral border, and in the median line upon its upper aspect; these communicate with the hæmorrhoidal veins at the base of the bladder, and are sometimes found of considerable size, especially in elderly subjects.

The nerve to the bulb also sends branches of supply to the urethra, as does also the hypogastric plexus of the sympathetic. These have not been satisfactorily traced to their ultimate distribution. That the supply is nevertheless ample, although it may be delicate and minute in its final details, may certainly be inferred from the acute sensibility which the canal possesses.

We now arrive at the second and most important division of the structures which claim consideration in connection with the urethra. The mucous membrane has been examined; but this, as has been already stated, is surrounded by other tissues, which may and do greatly influence the condition of the canal. These may be considered under three heads, viz.:—

1. Fasciæ.
2. Muscular Tissues, voluntary and involuntary, with noncontractile fibres intermixed.
3. Erectile Tissue.

1. The Fasciæ.—These first will be considered in respect of their relation to the urethra, because an acquaintance with them is important to the correct understanding of other structures, the consideration of which is to follow. They serve to maintain the passage through a part of its course in a fixed and constant position, and are intimately connected with the occurrence of certain pathological states hereafter to be noticed.

"The deep perineal fascia," as it is now more generally called, of which the "*triangular ligament of the urethra*," the "*perineal aponeurosis*," &c., are synonymous, but perhaps less appropriate terms, is usually described as consisting of two layers of firm fibrous tissue, stretched across the triangular space which intervenes between the two rami of the pubic bones including portions of the ascending rami of the ischium; the one corresponding with the anterior surfaces of those bones, and the other with the posterior, both being firmly united to and blended with their periosteum, thus defining an interval the depth of which from before backwards varies from about half to three-quarters of an inch. These layers are united at the apex to the subpubic ligament, and their fibres interlace with the ligamentous connections of the pubic symphysis, before and behind respectively. The denser portion of the fasciæ may be considered as about an inch and a half, or a little more, in depth. At this point the two approach and coalesce, forming one structure, from which a thin fascial membrane descends posteriorly to cover the inferior or perineal surface of the levator ani muscle. The anterior layer is in contact in front with the muscles of the perineum, the erectors, accelerators and transverse, and beneath the last named, after the junction of the layers already referred to, becomes continuous with the superficial fascia of the scrotum and abdomen, which dips down to join it, and is also united laterally to the pubic rami, so that a pouch is formed by which urine extravasated anteriorly to this layer of the deep fascia is prevented from passing backwards into the perineum, but finds its way upwards over the abdomen; being limited inferiorly in that situation, and prevented from descending upon the thighs, by the close connection which exists between the abdominal fascia and Poupart's ligament.

This deep perineal fascia is perforated by the urethra at about an inch below the pubic symphysis, although the distance varies from three-quarters to an inch and an eighth, according to measurements made by myself, a fact before referred to. The canal is in this situation partially fixed, and its course cannot be greatly altered except by the application of some violence, as its parietes are intimately united to the fascia, the fibrous covering of the corpus spongiosum forming a continuous structure with the anterior layer, while the posterior layer gives a prolongation backwards, which is in like manner continuous with the capsule of the prostate lying immediately behind it.

The aperture for the dorsal vein of the penis is about half an inch below the symphysis pubis; and near the bone on each side, the terminal branches of nerve and artery supplying the penis also perforate the anterior layer of the fascia. Between the two layers are contained the membranous portion of the urethra, the compressor muscles, the arteries of the bulb, the vessels and nerves already named, and Cowper's glands and their ducts. Thus far I have employed, in accordance with the prevailing custom, the term "deep perineal fascia" to denote two layers of membrane which close in the pelvic outlet, in the situation of the pubic arch. But it is, strictly speaking, more correct in an anatomical point of view to employ this term to designate the anterior layer only, since the posterior layer is in truth more accurately described as a portion of the *pelvic* fascia, and it is now regarded as such by some of our best authorities. The important connections of the fasciæ can only be sufficiently demonstrated by careful dissection, and this it will amply repay the student to devote to the part in question.

2. MUSCULAR TISSUES, *Voluntary and Involuntary.*—I shall notice first the ***involuntary muscular fibre***, a contractile tissue of the same character as that which has been recognised as entering into the structure of the bladder, air-tubes, intestines, &c. The experience of practical surgeons had long ago led them to infer the existence of such fibres in or around the urethral canal. Hence we find the possession of vital contractility attributed to it by John Hunter,[*] whose observations of the healthy and morbid actions of the part, alone led him to regard the urethra as undoubtedly containing muscular tissue in its composition. Sir E. Home, in the first volume of his work on Strictures of the Urethra,[†] published in 1805, expressed similar opinions, and subsequently investigated the various structures entering into the composition of the urethra, erectile bodies, and intervening tissues, microscopical examinations of which were made by Mr. Bauer; and drawings of the objects described are given in the third volume of the work above mentioned, published in 1821.[‡] Those however which relate to the histological elements of the tissue immediately surrounding the

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[*] "The substance of the urethra is muscular, and is therefore capable of contracting its canal, similar to an intestine, so much so as to shut it up entirely. This makes it subject to diseases peculiar to muscle in general, which is indeed the only proof we have of its being muscular . . . .

"In a sound state of parts these muscles are never excited to violent actions, acting simply as sphincter muscles, but when irritated they are capable of acting violently, as is best seen in some cases upon the first use of injections, the urethra often refusing the injection entirely. This seems rather to be a salutary motion to hinder things from getting into the bladder; but there are often spasmodic contractions of these muscular fibres in different parts of the canal, shutting up the passage and obstructing the course of the urine, often not allowing a drop to pass. That this is owing to a spasm upon the muscular fibres is evident, because a larger bougie will sometimes pass when it is at the worst."—*Hunter on the Venereal Disease*, 3rd edition, p. 174.

[†] "This natural power of contraction . . . . . is common to the whole canal of the urethra, although probably not equally great in every part of it. . . . . . . but this membrane, like every other muscular structure, is liable to spasmodic action, which produces a degree of contraction beyond the natural, and in that state the canal loses the power of relaxing till the spasm is removed."—P. 18, vol. i.

[‡] "The muscular covering by which the membrane is surrounded, or enclosed, is made up of fasciculi of very short fibres, which appear to be interwoven together and to be connected by their origins and insertions with one another; they all have a longitudinal direction . . . . The fasciculi are united together by an elastic substance of the consistence of mucus."—*Ibid.* P. 28, vol. iii. 1821.

urethra are imperfect, since the optical instruments used were far inferior to those possessed at the present day, and the distinctive microscopical characters of the various fibres were unknown, the means employed being insufficient for the purpose. Hence is described but one kind of fibres, which he denominated "muscular," lying in a longitudinal direction around the urethra; these are figured as they appeared when magnified to 15, 25, and 50 diameters, and there is little doubt but that they were the yellow elastic fibres and the areolar fibres, presently to be described as intervening between the mucous membrane and the layer of true muscular tissue.

Mr. Wilson also corroborates these views in especial allusion to Sir Everard Home's work.* On the other hand, many writers have denied the possession of muscularity to the urethra, and others limit the occurrence of what they call spasmodic stricture solely to the membranous portion.

But the question no longer rests on inferential opinions, however shrewdly drawn, from the phenomena which the actions of the urethra manifest; but microscopical examinations lately pursued under the powerful instruments of the present day, combined with that knowledge of the minute anatomy of the tissues which we now possess, have demonstrated beyond all dispute, that the urethra throughout its whole course is surrounded by muscular tissue of the involuntary kind above described.

To Kölliker of Wurtzburg, I believe, is the credit due of first publishing the fact of their existence, although the account he gives is not in all respects corroborated by the researches of English anatomists.

His description, published in the "Zeitschrift fur wissen," Leipzic, 1848, in an article entitled "Beitrage zur Kenntniss der glatten Muskeln," is as follows:—

Speaking of the muscular tissue, he says, "Its relations are most complicated in the prostate gland and the prostatic portion of the urethra, which is rich in muscular fibres. So large is the quantity of this tissue in the gland itself, that the true glandular structure constitutes scarcely one-third or one-fourth of the whole. On removing the mucous membrane from the prostatic portion of the urethra, the yellow longitudinal fibres of the caput gallinaginis come first into view, which form the lower end of the trigone, and contain very few muscular fibres. On both sides of the caput gallinaginis, and extending to the anterior wall of the urethra, similar yellowish longitudinal fibres present themselves, and form a strong layer towards the neck of the bladder; but towards the membranous part of the urethra they gradually decrease to a very delicate layer. This *longitudinal* fibrous layer of the prostatic part is connected internally to the sphincter vesicæ, by a thin and indistinct layer of fibres, with some of the longitudinal muscular fibres of the bladder; but by far the greater part of it is unconnected with this latter: it consists of half fibro-cellular tissue with many nucleus fibres, and half of evident, smooth muscular fibres with characteristic nuclei. After this, and external to it, follows, secondly, a strong layer of yellowish circular fibres of muscular and elastic tissue. This layer is connected above with the sphincter vesicæ, where also it is most developed, whilst below it becomes gradually thinner, and below the caput gallinaginis is either lost or appears only in very small quantities. On removing the several muscular layers, we come at last to the proper glandular tissue of the prostate, of which individual lobes penetrate among the circular fibres just mentioned, their excretory ducts passing through the longitudinal fibres.

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* "Lectures on the Structure and Physiology of the Male Urinary and Genital Organs," by James Wilson, F.R.S., &c. 1821, p. 149–50.

"In the membranous parts of the urethra the smooth muscular tissue is less developed. Under the mucous membrane, whose cellular tissue is remarkable for abundance of elastic fibres, there is a layer of longitudinal fibres, which are connected with those of the prostatic portion. These fibres consist, for the most part, of fibro-cellular tissue, with nucleus-fibres, and include, in small numbers, undulating, delicate, and curved, contracting fibre-cells (of the nature of smooth muscular fibres), which may be, in part, isolated. . . . . . External to these longitudinal fibres, there is a strong layer of transverse fibres, which belong, for the most part, to the *musculus urethralis*. Some of those, however, especially those belonging to the inner layer, display some strong bundles of smooth muscular fibres, together with fibro-cellular tissue and nucleus-fibres, and a partial mixture of fasciculi of the transversely-striated fibres of the *musculus urethralis*.

"The smooth muscular fibres are generally still less developed in the spongy portion of the urethra. In some cases they appear in exactly the same manner as the longitudinal fibres in the membranous portion; in other cases longitudinal fibres may be seen, but no muscular tissue can be found mingled with the cellular tissue and nucleus-fibres of which they consist. At a certain depth, however, some longitudinal fibres are distinguishable, with a more or less considerable admixture of smooth muscle, which fibres cannot be regarded as beams of the corpus cavernosum urethræ (*corpus spongiosum*), since they have no venous space between them, but rather form a continuous membrane, which limits the corpus cavernosum urethræ towards the mucous membrane. One might consider this part as belonging to the corpus cavernosum urethræ, in which point of view we shall deny any muscular membrane to this region of the urethra; but it seems more natural to regard the whole corpus cavernosum as a highly-developed muscular layer, provided with peculiar blood-vessels; for a large quantity of smooth muscular fibres, together with the cellular tissue, vessels, and nerves, entering into the structure of its beams and cords as far as the glans, render this body an eminently contractile structure." *

It appears, also, that Mr. Hancock, of the Charing Cross Hospital, assisted by Mr. Jabez Hogg, had been contemporaneously making microscopical investigations, with the same object and results, which were announced by him, in a paper read before the Medical Society of London, February 1st, 1851. His description is a little more minute in some points than that of Kölliker, and deserves consideration from the fact that it appears to have been rendered altogether independently of any other, and in unconsciousness of its existence. It professes to contain original matter on this subject, while it is somewhat at variance with the statements of Kölliker, in one or two particulars. Mr. Hancock states that he has re-examined these points, and is fully assured of his own accuracy. His views are now fully given, in the form of the Lettsomian Lecture, delivered before the Medical Society of London, February 18th, 1852.

He thus expresses himself: †—

"The organic muscular fibres in the prostate gland, connected with the urethra, are continuous with those of the internal muscular coat of the bladder, whence they may be traced by careful examination, passing forward through the prostate gland; these fibres, destined to invest the membranous and other portions of the urethra, appear to me to be entirely distinct from the organic muscular fibres found in large quantities throughout the gland, particularly around the sinus pocularis, in the verumontanum or caput gallinaginis, where the principal excretory ducts of the gland, with the common ejaculatory ducts, open. Organic muscular fibres surround the various ducts, which permeate the gland in all directions, and may, in the instance of the common ejaculatory ducts, be traced into the gland from the vas deferens, where they may readily be seen.

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* From an extract contained in the article, "Urethra," in the Cyclopædia of Anatomy and Physiology.

† Vide "Lancet," February 21, 1852, which contains a *verbatim* report of the lecture. And more recently in a small work, published in 1852, entitled, "Strictures of the Urethra," &c., by H. Hancock, Esq.

"The same arrangement obtains around the proper excretory ducts of the gland, and is beautifully shown where calculi are present in any quantity or size, in which case the foreign body may be seen impacted in the duct or cell, with a circle of these organic fibres surrounding it. . . . . . But these general fibres are, as I have before observed, distinct from those derived from the inner layer of the muscular coat of the bladder, and which form a layer surrounding the prostatic portion of the urethra, separated from it merely by elastic and non-elastic areolar tissue. (Kölliker says these fibres, for the most part, have no connection with the muscles of the bladder.) The outer layer of the muscular coat of the bladder, on the contrary, passes forwards on the outside of the prostate gland, and laterally and inferiorly joins the fibres derived from the inner coat in front of the prostate gland, to assist in forming the organic muscular covering of the membranous portion of the urethra; whilst superiorly, or on the upper surface of the gland, these external longitudinal fibres are arranged in two or more bundles, which are attached, as Mr. Guthrie pointed out in the year 1830, to the pubes near its symphysis. From the front of the prostate the conjoined layer of organic fibres passes forwards to the bulb, investing the membranous portion of the urethra, covered by, but distinct from, the common muscles of the part, the latter being inorganic, voluntary, or striated; these being organic and nucleated. Arrived, however, at the bulb, these two layers again part company, and extend forwards through the whole length of the spongy portion of the urethra, the internal layer running between the corpus spongiosum itself and the urethra, but separated from the latter by areolar tissue;

the external lying on the outside of the corpus spongiosum, separating the proper spongy tissue from its fibrous investment. Upon reaching the anterior extremity of the urethra, these two layers again unite, and form a circular body or band of organic muscular fibres, constituting that peculiar structure usually denominated 'the lips of the urethra,' and which had previously been considered by Mr. Guthrie as surrounded by a peculiar dense structure, analogous to that which forms the edge of the eyelid, and which he believed was requisite to maintain the patency of the opening: so that not only have we the urethra supplied by a coat of organic or involuntary muscular fibre, but the spongy body itself lies between its two layers of involuntary muscle; an arrangement, doubtless, of very great importance, in relation to the due performance of the functions of the part. And, as regards the urethra, this arrangement holds good wherever we find the spongy tissue, whether the quantity of that tissue be small or great; for, at the glans, which is formed not only by increased development, but also by a folding back, as it were, of the corpus spongiosum upon the corpora cavernosa, we have these muscular layers multiplied; whilst on the upper surface of the urethra, where there is merely a narrow portion of corpus spongiosum, the same arrangement holds good. Independent of these layers of organic muscular tissue, nucleated fibres may be found distributed occasionally throughout the spongy tissue, but I think they belong more properly to the arteries of the part."

I have myself spent some time in searching for these fibres beneath the mucous membrane, with a view to be further assured respecting their existence. There is no difficulty in detecting them in the prostatic portion of the urethra, although they appear to be less numerous elsewhere.

They are most easily to be seen in the fœtus, but can be demonstrated in the same manner from the adult, and are best found by proceeding in the following manner:—Lay open a urethra from the upper part; stretch out a portion by means of pins upon a board, and dissect up carefully a small flap of mucous membrane from any part of the canal, that of the prostate or of the glans penis being the parts from which they can be most easily demonstrated; and the bundles of white fibrous and elastic tissue before seen lying beneath the transparent membrane are exposed; these being removed by degrees, a greyish layer comes into view, a small portion of which placed under an object-glass of a quarter of an inch focus, with a small quantity of water, will exhibit the appearances peculiar to the unstriped muscular fibre, which it is unnecessary to detail here. It is, however, a subject well deserving further investigation, as it requires to be explained how it is, that the adult urethra, in which we might rationally expect them to be most fully developed, affords them less readily than that of the fœtus. The presence of muscular fibres in large quantity in the substance of the prostate is easily demonstrated; and their office there may probably be, by contraction, exerted upon the glandular structure, to assist in the evacuation of its peculiar secretion. Their distribution, also, not only as a complete enveloping layer for the corpus spongiosum, but as entering into the structure of its walls, its trabeculæ and its vascular sinuses, is a fact of considerable importance, the demonstration of which explains some points in relation to the pathology of the urethra which have hitherto admitted of no satisfactory solution.

Since the publication of the first edition, Professor Ellis of University College has given, in the Med.-Chir. Trans., the result of his anatomical investigations of these structures. He states that "a submucous stratum of longitudinal fibres surrounds the urethra throughout its whole length, and is continued behind into the submucous layer of the bladder. It is strongest around the first third of the urethra (that next the bladder), especially so in the prostate, and becomes gradually thinner as it proceeds towards the end of the penis; much fibrous is intermingled with the muscular tissue. At the forepart of the urethra its fibres end in tendons in the usual way, many of these blending with the submucous fibrous tissue."* Professor Ellis recognises no circularly-disposed fibres in the submucous layer of the urethra; when such are found in the membranous portion, external to the longitudinal fibres, he regards them as belonging to a system of circular fibres which are continuous with those of the prostate and neck of the bladder, and which are prolonged forwards as a very thin layer covering the urethra in the membranous portion, and intervening between the canal and the voluntary muscles forming the constrictor of that portion. The system of circular fibres referred to, he denominates the "orbicularis urethræ;" for further description of which, see note, page 29. And lastly, where circular fibres are detected external to the longitudinal layer in the anterior part of the urethra, he refers them to the corpus spongiosum itself.

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* An Account of the Arrangement of the Muscular Substance in the Urinary and certain of the Generative Organs of the Human Body." By G. V. Ellis, Prof. of Anat. in Univ. Coll. Lond. Vol. xxxix. p. 327.

We now come to a consideration of the *principal* VOLUNTARY MUSCLES WHICH ACT UPON THE URETHRA.

These are the Levator ani, the Compressor or Constrictor urethræ, and the Accelerator urinæ; with the Transversus perinei, and the Erector penis, in a lesser degree.*

THE LEVATOR ANI.—This muscle, with its fellow, forms a contractile partition or floor for the entire cavity of the pelvis. Its relations to the neck of the bladder and prostate are most important, and render its anatomical description necessary. Its origin commences anteriorly, from an oblique line on the posterior surface of the ramus of the pubic bone, close to the symphysis; and this part of the muscle, descending by the side of the prostate, to unite beneath that organ and the neck of the bladder in the central point of the perineum, with the corresponding part of the opposite muscle, and being separated from the remainder, by a small quantity of cellular tissue, has been recognised by some anatomists (Santorini, Albinus, and others) as an independent muscle, under the name of the "*levator or compressor prostatæ*," a practice, the correctness and utility of which will, I think, hereafter appear, in considering the functions which seem to belong to the muscles of this part. Posterior to this, the fibres of the levator ani arise from a white line, seen within the pelvis running along the surface of the internal obturator muscle, as far as to the spine of the ischium; which line indicates the point at which the pelvic fascia splits into obturator and recto-vesical fasciæ, from the inferior surface of which latter, its fibres spring, as well as from the spine itself. From this extensive origin, the greater part converge to be inserted into the side of the rectum, and to interlace with its sphincters: those which are posterior uniting in a median raphé behind the anus, as far as to the coccyx, into the apex of which the last are inserted.

THE COMPRESSOR OR CONSTRICTOR URETHRÆ.—"Constrictor urethræ membranaceæ." (Müller.) These names are given to a mass of voluntary muscular fibres, lying between the two layers of fascia already described as the "deep perineal fascia." It is of great importance that the disposition of these should be understood, as in no part of its course does the urethra come into such close relation to a voluntary muscle. This subject has been surrounded by error and greatly mystified, by the partial and defective descriptions which have issued at various times respecting it. It is very rare indeed to find any one, unless he has specially studied this individual muscle by proper dissection, having clear and correct ideas respecting it. The ordinary perineal examinations of the dissecting-room do not disclose it, as it must be made a special object of search in a fresh body.

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* For *detailed* descriptions of the anatomical relations of these muscles, concerning which all anatomists are agreed, see any standard work on anatomy; it is also considered unnecessary to describe the smaller perineal muscles, recognised in works which systematically teach anatomy, since it is conceived that much space would thus be occupied without any corresponding advantage.

Mr. Wilson, in the first volume of the "Medico-Chirurgical Transactions," minutely described a muscle in this situation;* but, as it afterwards appeared, imperfectly; for always arriving at it in a lateral direction, he removed a large portion of its attachment before beginning the dissection, viz., the descending ramus of the pubic bone on the side commenced from, the normal position of which is absolutely necessary to its demonstration.

Mr. Guthrie, in his lectures at the Royal College of Surgeons, in 1830, and afterwards in his work, entitled, "Anatomy and Diseases of the Urinary and Sexual Organs," published in 1836, gave a full description of this muscle, both in the male and female (pp. 36 to 48), the sum of which I shall transcribe here in his own words:—

"On the upper part there is a median line of tendon attached to the pubes by fascia, one half of which runs backwards with the muscle, to be inserted into the upper surface of the prostate; the other half passes forwards on the urethra through the triangular ligament, to be inserted in front of it, near the union of the corpora cavernosa. On the under part there is a similar tendinous line, which is attached posteriorly to the fascia underneath the apex of the prostate, and forwards to the central tendinous point in the perineum.

"The muscle on its upper surface is covered by fasciæ descending from the pubes. From the median tendinous line, in the upper part of the urethra, the fibres pass outwards on each side, converging, as they proceed, so as to form a leg of muscular fibres. On the under surface the same thing takes place, and a leg on each side being thus formed from the superior and inferior fibres running from above and below the urethra, they unite and pass outwardly, that is, transversely across the perineum, to be inserted into the ischium near or about its junction with the descending ramus of the pubes on each side."*

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* Vol. i. p. 176. Illustrated with a plate. 1809.

In 1836, Müller also corroborated Mr. Guthrie's views, and, moreover, described a circular disposition of fibres around the tube, with which the others are continuous, which he called the "stratum internum circulare."†

But it is quite certain that this muscle had been observed at a much earlier period, having been figured by Santorini, and that in a far more correct manner than by Mr. Wilson, although, from want of adequate description, his demonstration was much less perfect than that of the subsequent observers mentioned.‡

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* The above is the substance of the description given by Mr. Guthrie in 1830, but is an extract from his "Lecture on Strictures of the Urethra," p. 14. London, 1851.

† J. Müller, "Ueber die Organischen Nerven der erectilen Männlichen Geschlechts Organe," &c.

‡ In Table XV. of the "*Septemdecim Tabulæ*," of Santorini, a posthumous work, fig. 3, letter F, there are clearly depicted both the upper and lower bundle of fibres, with the prostate lying behind, the views being made from the inside of the pelvis; and in fig. 4 of the same table is a delineation of the circular fibres described by Müller. Referring to the explanation of these at pages 170–1, which is not by Santorini, but in the words of his editor, Michael Girardi, professor of anatomy at Parma, I have carefully and literally translated from the Latin original as follows:—

"Fig. 3, F.—As often as I have closely compared this figure, as well as others, with dead subjects, I have marked these things to be observed. In the first place, when I had cautiously drawn away the bladder from the lowest part of the internal surface of the pubic bone, so that the ligaments of the prostate clearly appeared to me, they took their origin from a thin and narrow beginning, nevertheless being gradually increased as they descended; they were separated on both sides, as it were, into two parts, of which the inner and superior was attached to the sides of the prostate, but the outer and lower to the levator muscle of the anus. Beneath these, they being laid open and reflected to the sides, there met the eyes of those making inspection, above the prostate gland, the vessels enumerated by our teacher, called 'sinuses,'" &c., &c.

After describing these more fully, he proceeds:—

"Besides these sinuses of Santorini, as in other cases, so also in the present, delicate fibres appear to me, the writer of these notes, extended as it were over the broad membrane, which closely answering to this drawing, running outwards in a transverse direction above the isthmus of the urethra from the inner side of the processes of the pubes and surface of the ischium, pass on to the opposite side of the pubes, in which they are firmly inserted. Beneath these lie others, arranged in circuitous form, and comprehending the whole isthmus of the urethra, so that we think we are able to understand

Sir Charles Bell, in the letter-press which accompanies his Atlas of Engravings of Morbid preparations of the Urinary Organs, &c., details the anatomy of the healthy parts, and in a note appended to his description of the "*compressor urethræ*," (note 2, page 7.) writes as follows: "It may be inferred that Santorini knew this muscle, but he has not described it."

It is true that Santorini has not described the muscle in words, but the drawing is so complete that it is impossible to deny that, so far, his description is accurate. It will be observed that neither Santorini nor Mr. Guthrie have described *descending* fibres as a part of the muscular arrangement subsisting between the two layers of fasciæ, but only those which are transversely disposed. Mr. Wilson's observations, however, related to fibres having the former direction. His description, which need not be quoted, is that of a muscular sling supporting the membranous part of the urethra, and descending vertically from "the cartilaginous arch of the pubes," to which it is attached by two tendinous origins. He says it is easy to confound this with the levator ani, because the tendons of both muscles take the same direction, but that a cellular interval and some small veins separate them above, although, just below, a blending of their con-

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by inference, that Santorini wishes to show these in the fourth figure of this table, letter C."

The text is as follows:—

Fig. 3, F.—. . . . . "Quotiescumque una cum cæteris hanc potissimum cum cadaveribus figuram conferrem, hæc habui animadvertenda. Primum dum caute ex infima ossis pubis interna facie vesicam retraheram prostatæ ligamenta adeo aperte mihi occurrere, ut licet ex tenui, acutoque principio originem ducerent, tamen sensim aucta inter descendendum veluti in bina utrinque sejungebantur, quorum interius et superius prostatæ lateribus; exterius vero, et inferius musculis ani levatoribus adjiciebantur. Infra hæc, hisce discissis, atque ad latera reclinatis, supra prostatam glandulam intuentium oculis vasa, sinus appellata, et plura, et mirifice, invicem complexa, in Santorini labyrinthum composita, ab illis, Præceptore recensita objiciebantur," . . . . . . &c., &c.

"Præter hosce Santorini sinus cum alias, tum etiam in præsentia mihi hæc conscribenti fibræ tenu in latam veluti membranam fusæ occurrunt, quæ huic delineationi plurimum respondentes, ex interna processuum pubis, et ischii facie supra urethræ isthmum in transversum excurrentes, in oppositum pubis latus contendunt, eo valenter insertæ. His aliæ subsunt in orbem ductæ, totumque urethræ isthmum adeo comprehendentes, ut hasce figura hujus tabulæ iv., lit. C. Santorinum exhibere voluisse, conjectura assequi posse existimemus."

"These muscles are again figured in fig. 1, O O, and i i, of the same table; the former letters showing the transverse, and the latter the circular fibres. The description is found under those letters, and also under letter L, p. 167–8, of the work.

"*Io: Dom:* Santorini—Anatom: summi septemdecim Tabulæ," &c., &c. Michael Girardi. Parmæ, 1775.

tiguous fibres is sometimes seen. (Med.-Chir. Trans., vol. i.) In carefully dissecting these parts, I have had occasion to observe also the presence of muscular fibres descending from the pubic symphysis and adjacent bone to the membranous part of the urethra; and these appear to belong to the muscular apparatus now under consideration.

I therefore propose to comprehend by the term compressor urethræ muscle, the transverse layer of muscle above and below the urethra, and the obliquely descending fibres associated with it, together with the inner circular fibres already described.

THE ACCELERATOR URINÆ, or EJACULATOR SEMINIS (bulbo-cavernosus), is the next muscle of importance to be described. It is composed of two symmetrical halves, united by a median line of tendon, commencing at that central tendinous point in the perineum by which it is connected to the sphincter ani, the two transversus perinei muscles, as well as with that part of the levator ani which has been already seen to act on the prostate, and to be attached to that same centre of union for this group of muscles. This line of tendon, corresponding in direction with the raphé of the perineum, gives rise to fibres which pass horizontally outwards on either side to encircle the posterior two inches of the corpus spongiosum, including the bulbous portion, and unite in a fibrous expansion on its upper surface, *i. e.*, between it and the two corpora cavernosa; while fibres anterior to these are prolonged over the last-named bodies also, and meet in a tendinous layer over the dorsal vessels of the penis.*

This muscle can, therefore, directly compress the corpus spongiosum, and in a subordinate manner the urethra also, as well as those veins which return the blood from the penis in a state of erection, to the persistence of which condition it may, in this manner, possibly contribute.

The Erector Penis and *the Transversus Perinei* need no special description, inasmuch as they contribute only in a slight and secondary degree to affect the condition of the urethra, to which our attention is to be strictly limited.

The former has no power to produce erection, as its name would imply; it may, like the last-named muscle, help to promote its persistence by compressing the corpus cavernosum somewhat, but most probably serves, with its fellow, to maintain a firm and steady position of the penis during the state of erection.

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* Kobelt. "Die Männlichen und Weiblichen Wollust Organe, 1844."

The transversus perinei acts in concert with the muscles already described, and by assisting to preserve a fixed point, which is essential to their harmonious action.

Having given a brief sketch of the muscles chiefly concerned in the functions of the genito-urinary apparatus, I shall now, before proceeding to examine the erectile structure, consider in what manner they are performed, and more especially what influence muscular contraction may have in the acts peculiar to them.

There has been some disagreement and want of perspicuity in the statements of physiologists respecting the special functions of the muscles which surround and act upon the urethra; and as it is exceedingly important in relation to our subject to arrive at correct views respecting these functions, I have therefore been led to study them closely, and seek for information by independent observations of my own, the results of which, with the utmost deference to the high authorities from whom I may have been compelled in some particulars to differ, I beg leave to embody in the following statements and conclusions.

That the URETHRA, in its natural condition, and when not in action, forms a shut passage, the membranous walls of which, for the most part disposed in folds, lie in close approximation to each other, and are so maintained by the agency of contractile structures around.

That the ACT OF MICTURITION requires for its proper performance a patent condition of the passage, and consequently the complete relaxation of certain muscles, forming a distinct group, viz., the anterior part of the levator ani (levator prostatæ), the compressor urethræ, the accelerator urinæ,* the transversus perinei, and the erectores penis.

That this act is accomplished by the contractile power of the bladder itself, chiefly and primarily; the diaphragm and abdominal muscles co-operating to an extent which depends on the amount of force expended on its performance. The whole process in the healthy individual, in ordinary circumstances, always taking place in obedience to and under the control of the will.

That cessation of the act, whether occurring involuntarily, because the bladder is empty, or suddenly, by an act of the will, before complete evacuation has taken place, consists in the accurate closure of the neck of the bladder and urethral canal, through contraction of all the muscles forming the group described, which effort produces also, at the same instant, complete expulsion of the contents of the passage, which would otherwise leave it *guttatim*.[*]

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* Hence the term "accelerator urinæ" is a misnomer. The muscle is in a state which is the *reverse* of action during the process of micturition.

From these statements it may be concluded, *that the entire urethral canal, or, at all events, the membranous and spongy portions of it, can be contracted in calibre or closed by approximation of its sides, through the agency of muscular structures which surround it in obedience to an effort of the will.*

This fact will be again referred to.

That EMISSION OF THE SEMINAL FLUIDS, unlike to the act of micturition, is the result of a series of alternating, partial relaxations and strong contractions of the muscular components of the male genital organ; and is not the passage of a continuous stream through a flaccid tube, propelled by a muscular organ behind it; but is accomplished in the same manner that the last few drops of urine are expelled, viz., by the sudden approximation of the urethral walls anterior to the mouths of the seminal ducts, in addition to the muscular action which closes the neck of the bladder, and perhaps the contraction of the muscular constituents of the prostate itself.

We have seen from Kölliker, before quoted, how largely that tissue enters into the formation of this body; and it appears probable that not only is the seminal fluid expelled by the action of the levatores ani on the seminal vesicles (or, as some suppose, by a contractile power inherent in these bodies), but that by the contraction of the muscular constituents of the prostate itself, the ejection of its own gland-secretion is provided for, and the canal passing through it is considerably narrowed.[†] And further it appears not unlikely that it is the office of the verumontanum not only to close the passage behind and prevent regurgitation, as has been suggested (which, from its form, it may well be supposed to assist in doing, especially by its posterior portion), but that it may serve at the same time to *maintain a groove, patent on either side, for the exit of the seminal and prostatic fluids in the direction forwards*, during the contraction of the structures around, which two functions it appears well calculated to fulfil. These fluids, being propelled into the sinus of the bulb while the parts anterior to the prostate are in the state of partial relaxation supposed to exist, until a certain quantity having collected there, sufficient by its presence to excite a reflex expulsive act, a powerful and simultaneous contraction of all the muscles takes place; the compressor urethræ cutting off all communication behind in the manner of a sphincter, the involuntary fibres of the urethra making almost accurate closure of the whole spongy portion, and the erectile tissue around assisting to maintain the condition (in its injected state) aided by the firm grasp of the accelerator urinæ muscle.

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[*] This may be proved by the experiment of making firm pressure in the course of the urethra, in the perineum, with the finger, directly in front of the anus, immediately after such voluntary effort has been made, and then voluntarily relaxing the muscles as in ordinarily commencing micturition, when not a drop will escape from the urethra, showing that the canal was emptied by the same effort which stopped the flow; notwithstanding that the sensation of suddenly stopping a full stream of urine communicates the impression that there is still fluid remaining in the spongy portion of the urethra. The presence of a stricture in any part of the urethra, as will hereafter appear, interferes with perfect contraction, and occasions dribbling of urine after the act of micturition is concluded.

[†] Professor Ellis's recent dissections, before referred to, strikingly support the view which I took in the first edition, of the functions of the muscular apparatus for the

Thus regurgitation of the seminal fluids is prevented at two different stages of the process, in two different methods; during the one, or that of partial relaxation, while the contents of the vesiculæ seminales are issuing from the mouths of the vasa efferentia, and the

emission of urine and seminal fluid, and which is therefore still presented in the text. Professor Ellis says, "The prostate is essentially a muscular body, consisting of circular or orbicular fibres, with one large central hole for the passage of the urethra; and another smaller, oblique opening, directed upwards below the former, for the transmission of the common ejaculatory seminal ducts to the central urinary canal. . . . . Its circular fibres are directly continuous behind, without any separation, with the circular fibres of the bladder; and in front a thin stratum, about one-thirtieth of an inch thick, is prolonged forwards from it around the membranous part of the urethra, so as to separate this tube from the surrounding voluntary constrictor muscle." After giving further details, he continues: "From the above given anatomical facts, we may conclude that the prostate is less of a glandular than a muscular body, and is only a largely developed portion of the circular muscular layer that invests all the urethra behind the bulb or the spongy portion. . . . . As the prostatic enlargement includes only part of the muscular stratum on the urethra, I would propose the name of *Orbicularis vel sphincter urethræ* for both the prostate and the prolongation around the membranous portion of the urethra; whilst I would confine the old term prostate (without the word gland) to the thickened and more powerful part near the neck of the bladder. . . . . Its chief office" (*i.e.*, of the orbicularis) "will probably be, to hurry on the semen, and deliver this into the grasp of the voluntary muscular fibres of the constrictor urethræ, which are external to it along the membranous part of the urethral tube."—*Med.-Chir. Trans.*, vol. xxxix. pp. 331–2.

glands of the prostate pour forth their own secretion, by the uvula vesicæ and the posterior end of the verumontanum; and during the other, or expulsive act, when general or complete muscular contraction takes place, by the additional barrier formed by the compressor urethræ muscle before mentioned, acting in concert with the other muscles of the group.

The different, or rather *opposite* conditions, of the muscles in the two acts of seminal emission and micturition are well exemplified by the impossibility not only of performing them simultaneously, but even of making the latter act immediately follow the former, so powerful and continuous or repeated are the contractions necessary to its accomplishment. This is partly due to the persistence of erection, but appears to be by no means entirely so. This enduring action which is uncontrollable by the will, and peculiar to involuntary muscles, seems to indicate what may be a part of the special function of unstriped fibres which surround the urethral tube through its whole course, and so an additional point of contrast is afforded between the two acts in question. We therefore arrive at the second conclusion, viz.:—

That contraction of the urethra may be the result of a purely reflex act, uncontrollable by the will, and of a character differing from that of the voluntary contractions before described as relating to micturition.

We learn, then, that there are two sources of muscular action: the one in voluntary or striped fibres; the other in those which are involuntary and unstriped; and that it is therefore quite possible that each of these may at any time, either singly or in combination, exhibit their own peculiar mode of action in an unusual manner or degree, when a sufficiently powerful stimulus is present to interfere with their natural condition.

As a familiar but striking example of the reflex contractions which are wont to occur throughout the whole canal, I need but refer to phenomena which are familiar to all who have been in the habit of introducing instruments into the urethra, for patients especially who have never before submitted to the operation. Not only is the entrance of a catheter in such cases often sensibly opposed, but during withdrawal it seems to be forcibly expelled, so close is the contraction of the urethra upon the foreign body, even up to its last inch. There is no proof so good as personal experience. Let any man introduce one for himself, and he will soon be conscious, especially during its removal, of the great contractile and expulsive force called into play by every portion of the passage in question. It is an experiment worth the trying, and I hold that no man should attempt the passage of a catheter on the person of a patient, who has not first tried its effect upon himself. Again, every one knows that the more gently a sound is introduced, the better it makes its way along the passage; indeed the impetus of its own weight is often sufficient, and it slides through its course without obstruction; but let unnecessary force be applied, and the muscular tissue resenting it creates a certain amount of obstruction. So when the irritant is of a chemical nature, as when an astringent solution is injected, or a piece of caustic is carried down the canal, great contractile power is exhibited, and the instrument is often so firmly grasped in the latter case as to require some little time and tact for its extraction.

The bearing of all this on the subject, as well as its illustration of the reflex nervous function, will be farther seen when we come to consider the causes which give rise to temporary occlusions of the urethra.

Before leaving this subject it may be remarked that no very defined views on the specific function of *the neck* of the bladder, in relation to micturition, have been generally received by anatomists. The existence of a sphincter muscle there has been long a disputed point, and observers of equal celebrity may be found expressing opposite opinions on the subject. Some of these believe the closure of the viscus to depend on elastic tissue, which enters into its structure immediately behind the prostate. Others, and perhaps the majority, agree in considering the occlusion due to muscular action, but do not succeed or agree in pointing out the agency by which it is effected. It is evident that both the circular and longitudinal muscular fibres at the situation just indicated, exist in much larger amount than in any other part of the bladder; but their arrangement is certainly not sphincteric. They are no doubt chiefly concerned in the expulsive function of the bladder, and their aggregation here is the necessary result, as far as the longitudinal fibres are concerned, of their convergence to one point. That some barrier to the flow of urine exists at the neck of the bladder, cannot be doubted; and the form and position of the *uvula vesicæ* strongly suggest that this prominence must constitute it; since it need only be maintained in contact with the roof and sides of the outlet, in order to effect its closure, a position which appears to be its natural one in health. The performance of this action, as well as of the opposite one, which opens the urethro-vesical aperture, is attributed to certain muscular fibres, which arch over but do not surround this point, in combination with the longitudinal fibres of the bladder. An important part of this action I cannot but think ought to be assigned to the levatores prostatæ, which muscles, I am disposed to believe, in their ordinary condition of tone, maintain, or assist in maintaining, the prostate, and with it the uvula, at the slight elevation required to close the passage, and that the act of micturition commences in their relaxation; to accomplish this, it is most probable that the co-operation of other fibres may be necessary. This opinion I desire to submit, with great deference, to the consideration of other observers, but nevertheless must affirm, that it is grounded upon careful dissection and study of the parts, as well as upon observations of the phenomena which they exhibit in the living body.

But at no great distance from the neck of the bladder appears an arrangement of muscular fibres around the urethra, the disposition of which strongly suggests that their function must be sphincteric, viz., those of the compressor urethræ. Indeed, there is not much doubt that the membranous part of the urethra is closed by its action in health, and that it deserves the title which has been accorded to it by some, viz., " a sphincter of the urethra." The obstruction often found at or near to the triangular ligament, in catheterism, is probably sometimes due to this fact; and the little pain which is generally felt just at this point may sometimes arise from the forcible opening of the passage by the bougie, and not invariably from a morbidly irritable condition of the prostatic portion, to which it is not unfrequently attributed. By no means denying that the prostatic portion is frequently liable to exhibit such a condition, I conceive that we should not be warranted in regarding a sensation of pain at this point, and the desire to make water, often experienced as soon as an instrument arrives at it, as proofs, *per se*, of any morbid sensibility there. The latter symptom has been attributed to irritability of the trigone vesicale, and supposed to indicate the contact of the catheter with that portion of the bladder; but this, as Mr. Guthrie observed, is entirely erroneous, and takes place at an earlier period, long before the instrument has traversed the whole urethra. It is probably often due to sympathetic contraction of the bladder and entire expulsory apparatus, from irritation of *the sphincter of the urethra*, by the presence of the instrument in the membranous portion; and the larger the instrument the more forcible will be the expulsive effort.

The consent which obtains among the actions relating to defæcation and micturition is well worthy to be considered, as helping to indicate the offices of the muscles under consideration. In defæcation the first act permits the descent of the fæcal mass along the rectum; the levator ani, the sphincter ani, and that part of the gut containing the mass being relaxed; at the same moment there is a corresponding relaxation of the urinating apparatus, and the urine flows. The expulsive act is followed by instantaneous contraction of the sphincter ani and elevation of the extremity of the gut, doubtless from contraction of the levator muscle also; and it cannot be accomplished without a simultaneous contraction on the part of the urethral muscles, which as instantly stops the stream; and among these muscles, reasoning from their anatomical relations, I cannot doubt but that the anterior part of the levator raises the neck of the bladder at the same moment, and that the compressor urethræ acts the part of a sphincter to the urinary outlet,* just as the sphincter ani does to the fæcal one. On the other hand, the act of stopping the stream of urine cannot be accomplished without some contraction of the sphincter ani, so intimately connected are the muscles which preside over the two outlets in the perineum.

Thus we see that the act of defæcation cannot be performed separately from that of micturition, but the latter may be readily performed by itself alone. Nevertheless a process of a similar nature is always necessary for the accomplishment of either; a smaller degree of relaxation in the same set of muscles being sufficient to permit the urine to flow; a greater being required to perform defæcation in addition.

Thus when micturition is performed alone, the muscles of defæcation also may be relaxed to a certain extent, but not sufficiently for the accomplishment of that act. When, on the other hand, defæcation is performed, micturition generally takes place first, because the greater degree of relaxation includes the less. So, when in consequence of great urethral obstruction considerable effort is required to expel the urine, evacuation of the bowels frequently occurs, in spite of efforts to prevent it.

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* The anterior border of the compressor muscle forms the *true urinary outlet* in the male, as it does in the female; all that exists beyond it being, in fact, a male intromittent organ; so that the prolongation of the urethra is merely a condition contingent upon the necessity which exists for the accomplishment of the male sexual function.

In the ordinary quiescent condition, the two outlets are closed through the inherent tonicity of the muscles. The anterior portion of the levator ani (levator prostatæ), in raising the neck of the bladder, seems to maintain the uvula applied to the upper surface of the passage, in connection with the muscular fibres at the neck of the bladder, and the compressor urethræ probably acts as a sphincter. Thus it is, that when "tone" is destroyed, as from the non-transmission of nervous influence in injuries of the spine, causing paralysis, the levator prostatæ and compressor urethræ no longer act, and incontinence is the result. Just so in the economy of the fæcal outlet, the levator ani *proper* (by which term the muscle which belongs strictly to the anus is intended), and the sphincter ani, when disconnected from the nervous centres, permit involuntary defæcation, as being analogous with the two which preside over the urinary outlet.

3. ERECTILE TISSUE.—This has already been partially described in the extract from Kölliker's paper quoted above. It comes into relation with all that part of the urethra anterior to the deep perineal fascia, constituting the corpus spongiosum, though prolonged somewhat farther upon its inferior than on its superior aspect at that spot where, by its dilatation, the bulb is formed. A similar enlargement occurs at its other extremity, having an exactly opposite relation to the urethra, being placed chiefly above it to form the glans. Here especially also the muscular tissue, described by Kölliker as interwoven with its substance, occurs in great abundance, and renders it, as he describes, "*an eminently contractile structure.*" Besides this, a thin layer of the erectile tissue passes backwards from the bulb, closely beneath the mucous membrane, and surrounds the urethra through the membranous portion, intermingling with the unstriped fibres already noticed, and is doubtless the source of the hæmorrhage which not unfrequently follows the use of instruments there. This vascular layer derived from the corpus spongiosum, also sends an offshoot into the verumontanum, by means of which the latter possesses some amount of erectile function, and then anastomoses with the net-

work of vessels around the neck of the bladder. It is deemed incompatible with the design and extent of this work to enter into any minute examination of the erectile tissue itself, inasmuch as beyond the facts of its great vascularity and its contractility, nothing remains of importance in relation to stricture: added to which, elaborate accounts of its anatomical structure exist, to which the writer would refer for additional information respecting it.* So also it will be unnecessary to do more than name the corpora cavernosa, inasmuch as the only influence they can exert on the urethra is that of elongating it when they are charged with blood, and so producing a change in its *direction*, which latter subject I shall presently consider by itself.

There is a point, however, esteemed of importance in connection with practice, relating to the internal structure of the corpus spongiosum in the situation of the bulb, which has to be noticed. Owing to the free inosculation of the vascular passages with each other, which appertains to that structure, incisions carried into it have always been regarded as liable to give rise to considerable bleeding. But it has been alleged that the occurrence of this accident is rendered much less probable when such incisions are made strictly in the middle line, inasmuch as with such precautions a fibrous partition existing there, receives the knife and defends the vascular structures on either side. Most anatomical writers of the present day agree in affirming the presence of this partition. It is described on the authority of Kobelt, who published it in his work entitled "Die Männlichen und Weiblichen Wollust-Organe," in 1844, as formed by the dipping inwards, in the median line, of the fibrous envelope of the corpus spongiosum at its bulbous part, by which means a bilobed condition of that body is supposed to be formed. On the other hand, its existence has been wholly denied.† I have accordingly embraced several opportunities of making transverse sections of the bulb, and can most unhesitatingly confirm the statement that a partition exists, and may sometimes be traced forwards to within two or three inches of the external meatus. It is distinctly seen, in some instances, to be composed of two layers with a faint dark line between them, indicating that the coherence of two bodies in the middle line, to form a single corpus spongiosum, is the typical formation, traces of which were present in all the subjects examined to a greater or less extent. The relation of the partition to the fibrous covering of the bulb does not, however, appear to me to be precisely that which has been just described. Instead of being connected with the external fibrous envelope, I have found it, after repeated dissections, to be chiefly developed in the interior of the bulb, immediately beneath and closely attached to the urethra, from which point it becomes less marked as it approaches to the circumference. Moreover, the posterior part of the bulb receives many more fibrous partitions or prolongations into its substance than any other part of the spongy body. See Plate II., which shows several transverse sections of the bulb, made when fresh, in different subjects, and at different portions of it. The parts thus represented, together with other sections of the bulb, in all from fourteen bodies, which I examined in relation to this point, form preparations now in the possession of the Royal College of Surgeons. Since the appearance of the first edition, Professor Ellis has shown in a Memoir before referred to, 1st. That the envelopes of the corpora spongiosa and cavernosa are composed of organic muscular fibre. 2nd. That the median septum of the corpus spongiosum, although thicker in substance near to the urethra, reaches as far as to the external envelope, with which it may be demonstrated to be continuous, in the bulbous portion. (Med. Chir. Trans., vol. xxxix.) It is now therefore proved that this septum is not formed by a folding inwards of the outer envelope, as supposed by Kobelt. The description of Professor Ellis's dissections, and the plates which illustrate them, should be consulted in relation to this subject.

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* See article "Penis," in the "Cyclop. of Anat. and Phys.," and most elementary works on anatomy.

† Professor Lizars, in the "Medical Times," August 16, 1851, states that he has never seen this septum; that he has recently examined "two bodies," "but could perceive no septum whatever," and he presents a drawing denoting its absence.

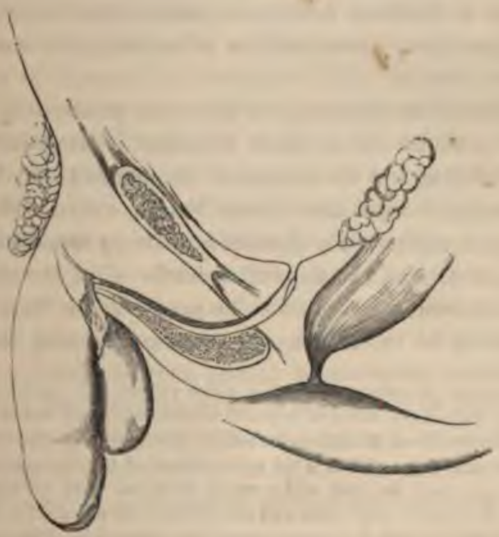
It would appear, then, that the relation of structure to the question of hæmorrhage stands nearly thus:—

That the entry of the arterial branch of supply at about a half or three-quarters of an inch anterior to the posterior extremity of the corpus spongiosum, renders incisions at this point liable to become the cause of considerable hæmorrhage. That the existence of several fibrous partitions in the part posterior to the entrance of the artery, and especially one in the middle line, may possibly tend to render incisions into that part of the bulb so defended, less productive of hæmorrhage than in parts where these do not exist.

But when the difficulty, it may be said impossibility, of hitting the exact line of this slight partition, as may be proved on the dead body, is taken into consideration, it cannot be seriously argued, I conceive, that the prevention of hæmorrhage depends upon the accomplishment of so delicate an operation. No doubt but the median line in sections of the bulb is the line of safety; and why? Because a short branch of the pudic enters it *on each side*, close to which, if an incision be made, the artery might almost as well itself be opened. But if the section lie equidistant, or nearly so, from the two vessels, the minute meshes of erectile tissue intervening between the section and the artery, entangle within themselves the coagula which are formed, become choked or blocked up, and so conduce most readily to the checking of hæmorrhage, more especially if this be favoured by external cold applications.

It is extremely important to understand correctly the situation of the bulb in relation to the surface of the perineum, to the rectum, and other adjacent parts. In the ordinary dissection of the perineum, the distance at which it lies from the surface (which greatly varies at different points) is not seen, because in prosecuting it the structures are necessarily removed, layer by layer, until the bulb is reached. And its relation to the rectum is also incorrectly exhibited, because, after the dissection backwards of the flaps of integument, and, still further, after the removal of the muscles, and consequent division of the attachment of the sphincter ani, the rectum falls considerably from its natural position. In order to obviate these sources of error I have several times practised the following dissection:—The body being tied up as for lithotomy, a long needleful of silk or twine should be carried firmly through the integument just anterior to the anus, and fastened in the same way to the skin of each thigh above, with that degree of tension which shall maintain the anus in its proper place after the integuments and other parts are removed. An incision about four inches long is then to be made through the integuments along the line of the raphé, and of course over the longitudinal axis of the bulb, to within half an inch of the anus; and from its upper extremity a similar one is to be carried transversely outward; the angular flaps so formed must be reflected outwards, and a careful dissection continued to the deeper structures, dividing the median tendon of the accelerator urinæ muscle, in a line with the first incision, and removing it, so as to clean the bulb and disturb its position as little as possible. Of one of the most successful of these dissections, Mr. H. B. Tuson made for me a model in wax, moulded upon a plaster-cast taken from the body itself, which conveys the appearances of depth and position in a manner not to be accomplished by drawings. Upon these, however, I have constructed a diagram which correctly exhibits the relations of the parts referred to. (Fig. 1.) I have thus fully entered into the examination of this subject, because of the importance it possesses in relation to certain operative proceedings which it may be sometimes necessary to undertake at this part, as will appear in a subsequent portion of this work, and be again referred to.

FIG. 1.



DIRECTION OF THE ADULT MALE URETHRA.—Nothing can be more essential to success in the act of traversing with an instrument, more or less pointed, as a sound or catheter, this delicately-constructed canal, than correct knowledge respecting the direction which it assumes throughout every portion of its course, as well as of other mechanical conditions which belong to it, and are constant in health, such as size, mobility, &c.; and as these vary considerably in its different regions, each of the latter must be carefully considered by itself.

THE SPONGY REGION, as has been already stated, is the most moveable part of the canal; its anterior half at least, taking any direction (in the flaccid condition of the penis), which gravity or applied force may give it. As it approaches the pubes, it becomes more fixed; the penis being here suspended by a ligament, and the crura or bases of the cavernous bodies which form it being attached to the pubic rami, while the bulb is closely connected to the deep perineal fascia. The canal now curves, to pass beneath the pubic symphysis, and will follow a course varying slightly in direction, according as it lies nearer to, or more distant from, that point: the extreme variation which I have noticed in adults, amounting to about a quarter of an inch, that is to say, the urethra perforates the fascia at a distance below the pubic arch, which varies in different subjects from seven-eighths of an inch, to one inch and an eighth.

THE MEMBRANOUS PORTION, in the erect position of the body, ascends with a slight curve, which direction is continued through the prostate, until at last the course of the urethra into the bladder is almost vertically upwards. Plate No. I., very carefully drawn from the subject, represents a dissection made by me, on the body of a man, 37 years of age, two days after death. The innominate bone is only partially removed, in order to preserve the visceral connections undisturbed.* It will convey a more correct idea of the course of the urethra than can be conveyed in words, and represents the relation of parts as existing in the nearly horizontal position usually assumed in recumbency, the shoulders only being slightly raised. By turning the plate, so as to make its left side the bottom, the situation of parts in the standing position of the body is exhibited.

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* The proper method of making a dissection which will show the relation of the parts within the pelvis, and a more useful employment of the scalpel can scarcely be pursued by the student who desires an efficient acquaintance with the anatomy of the pelvis, is first to dissect the perineum as far as to the *anterior* layer of the deep perineal fascia and no further, removing from the bulb and corpora cavernosa their enveloping muscles; then to place the body on the right side, and saw through the pubic rami an inch and a half to the left of the symphysis, so as to preserve the connections of the penis, prostate, and bladder, with the pubes uninjured. The soft parts are, then, to be carefully separated close to the bone, which is to be sawed through near to the sacro-iliac synchondrosis. The loosened bone is then to be removed, leaving the soft parts in the dissection beneath, so that the muscles, fascia, &c., may not be disturbed. This is to be followed by a careful dissection of the structures, and opening of the peritoneal cavity, taking especial care to maintain the relative position of the prostate, bladder, and rectum, and not to "*clean*" so elaborately as to remove their cellular connections. On this principle the dissection delineated was made, and although it is one which can rarely be obtained in the dissecting-room, it is exceedingly desirable to find some opportunity of doing it, and upon a body as fresh as can be obtained. I have done it several times, and never without deriving advantage from the exercise.

The practical points to be noted, are—

FIRST: that the lowest part of the passage in the upright position of the body is that part which is in contact with the anterior layer of the deep perineal fascia;* and that the floor at this point forms, to some extent, a fulcrum upon which the instrument turns, when its handle is depressed for the purpose of carrying the point onwards into the bladder.

SECONDLY: respecting the influence of the layers of fascia, by their contact with the urethra, the anterior layer exerts by far the larger share, in stopping the progress of an instrument; indeed the posterior, from the contiguity of the prostate, can scarcely be supposed ever to become an obstacle. The bulbous portion which has already been demonstrated to possess considerable dilatability, (page 7,) being immediately in front of the anterior layer, permits more freedom of motion in the point of a sound here than elsewhere, while the unyielding fibrous tissue around the commencement of the membranous part suddenly limits it. Hence this is a point at which the progress of the instrument is sometimes more or less arrested, even when no stricture exists, although the slightest management is usually sufficient to overcome the difficulty. Moreover, it is probable that this portion is somewhat more firmly closed, especially on the approach of a foreign body, by the action of the compressor urethræ muscle. But if organic contraction of the canal exist here, or a little anterior to it, which is the more common site, it is most easy to understand how readily any misdirected force, when perseveringly applied, may lead, if not at once to false passage, yet to an indented or sacculated condition of the urethra in front of the stricture, greatly increasing the difficulty of guiding the instrument through it, and facilitating the production of a false passage at some future attempt.†

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* Mr. Briggs states it to be about a quarter to three-eighths of an inch posterior to this point.

† Preparation No. 2536, among many others, in the Museum of the Royal College of Surgeons, is an excellent illustration of these remarks.

THIRDLY: that the urethra follows a curved course beneath the pubic symphysis, and in so doing describes the arc of a circle, whose diameter depends somewhat upon the operation of certain causes which influence its direction. It follows, therefore, that the curves of instruments employed to traverse it may advantageously vary also. Nevertheless, it is important to ascertain what is the ordinary or most prevalent curve, that it may be made the basis upon which to construct instruments for general use.

Mr. Briggs, whose inquiries have been already alluded to, has described the curve of an average and well-formed urethra as "commencing at one inch and a half anterior to the bulb, and from this to its termination in the bladder, forming an arc of a circle three inches and a quarter in diameter; the chord of the arc being two inches and three quarters, or rather less than one-third of the circumference." I have made repeated observations on the dead body by dissection in different ways, in order to arrive at a conclusion respecting this subject. I believe that this is a pretty accurate description, if considered as applying to average cases. Fig. 1, exhibits a *diagram*, reduced upon scale, from one which was constructed, of the life-size, from several dissections made on the plan described in the preceding page. At Fig. 7, the curve is drawn of the natural size, together with the outline of an instrument made to correspond with it.

There are many circumstances, however, which exist in a state of health, materially to influence this direction.

Thus, in spare men, of small frame, with narrow shoulders and pelvis, the general development, as well as the size of the genital organs being below the average, I have frequently observed the curve of the canal to be more acute, and have found it desirable to increase that of the instrument to be employed, in order to facilitate its introduction.

In corpulent subjects, as a rule, the curve is diminished, and the angle which the plane of the bulbous portion forms with that of the prostatic part is more obtuse, as these parts are more widely separated by the intervention of masses of adipose tissue.

Again, the action of the abdominal muscles appears to exercise a slight influence upon the curve by drawing up the suspensory ligament of the penis, while relaxation of those muscles permits the penis to be lowered to some extent, and a portion of the curve to be effaced. Hence, in difficult cases of catheterism, we place the patient in the recumbent position on his back, with the shoulders and thighs slightly raised in order to relax those muscles, and permit the movements of the instrument to be made in a line as direct as possible to the obstacle to be overcome.

There are other circumstances which render desirable the employment of an instrument which is more curved than that which is required by the healthy adult male. The more elevated position of the bladder behind the pubes in children, renders the use of such instruments necessary for them; and on the same principle a stronger curve is also employed in those instances of enlarged prostate and thickening about the neck of the bladder, which are frequently met with in elderly persons.

The difference which exists in the direction of the urethras of young and adult subjects respectively, consists in the stronger curve which the prostatic part in the former describes in ascending from the membranous, occasioned by the higher situation of the urinary bladder. The prostatic part is also comparatively *longer* than in the adult, from the same cause; a character which applies equally to the condition of enlarged prostate just referred to. The *diameter* of the canal is also more uniform throughout in children. It bears in size a relative proportion in regard to age up to puberty. In the old, the urethra is sometimes larger than at middle age; a condition apparently due to relaxation or want of tone in the contractile tissues around it.

The normal direction of the urethra may be interfered with by certain morbid conditions of neighbouring parts. Thus, deformity of either corpus cavernosum from contraction of lymph effused into its substance, may distort the passage by deflecting it to either side. Prostatic enlargement has been alluded to; hypertrophy of the median portion or "third lobe" has been seen to occasion a channel on either side, thus dividing the canal in two. Abscesses, tumors in the course of the canal, most frequently within the pelvis, which may be malignant, hydatid, &c.; scrotal herniæ of large size, and hydrocele, may all occasion some deviation from the usual direction.

LASTLY: it may not be forgotten, that while the course which the urethra naturally describes is thus curved, a straight instrument may be passed with perfect ease, without inflicting any injury upon it. The curve is in this case obliterated, by using the portion which is anterior to it as a fulcrum, by which to carry the point closely along the roof of the canal throughout its course. A moderate amount of pressure is at the same time requisite, in order thus to alter the direction of the canal.

The following inferences are stated in the form of propositions, and are deduced from a consideration of the facts cited in the foregoing pages, as a digest of the anatomy and physiology of the organs in question, as far as these bear relation to the subject, and for the sake of presenting a clear and perspicuous view of it before entering on the next section.

1. That the urethra is composed of a delicate and sensitive mucous membrane, exceedingly vascular, and well supplied with nerves, the area of which is increased by numerous small glands and follicles; and that it is closely connected by its sub-mucous areolar tissue with *involuntary muscular fibre in every part of its course*, the distribution of which is not quite equal in quantity throughout.

2. That, in some parts lying between the two, in others, often interlacing with these contractile fibres, but for the most part, lying in longitudinal bundles beneath the mucous membrane, and united by transverse fibres, is also a varying amount of the *fibrous and yellow elastic tissues*.

3. That in the PROSTATIC AND IN THE SPONGY portions of the urethra, the glandular and erectile structures respectively, which lie next in order to the above-mentioned contractile tissues (proceeding from within outwards), are associated with a large proportion of involuntary muscular fibres, which, while they act by evacuating, in either case, the contents of the organ,—in the one, a glandular secretion, in the other, the blood supplied for erection, form also an agency, which, in certain states, is brought to act more or less on the capacity of the urethral canal; and this agency may be somewhat increased by the co-operative action of the accelerator urinæ muscle.

4. That in the MEMBRANOUS portion, there is also *close contact of voluntary muscle*, the disposition of the fibres of which is such, that it cannot be doubted, that whatever may be its degree or extent, its function is to close the canal at this point; the sphincteric character of the muscle being most strongly indicated by its structure, as well as by what we infer respecting its actions, as manifested by phenomena both natural and morbid.

5. That not only does vascular or erectile tissue surround the whole of the spongy part of the urethra, but that a thin layer of it encircles the membranous portion also, and that from the peculiar structure and function of this tissue, laceration or division of it may be attended with considerable loss of blood.

6. That while the PROSTATIC part is moveable to a small extent in a direction upwards and downwards, in obedience to muscular action, the MEMBRANOUS is nearly fixed and constant in position, from the application of unyielding structures (fasciæ) to it, in such a manner as greatly to limit the mobility of the part; and lastly, that within certain limits the SPONGY part is moveable in any direction, the bulbous portion being less so in the ratio of its proximity to the anterior layer of the deep perineal fascia by which it is partially retained *in situ*, as well as by the corpora cavernosa, and by the triangular ligament above, uniting the penis to the pubes. The anterior two-thirds of the passage (more or less in different subjects) being for the most part free and moveable.

CHAPTER II.

CLASSIFICATION AND PATHOLOGY OF STRICTURES OF THE URETHRA.

Definition of the term stricture—Other definitions—Strictures are either permanent or transitory—Permanent contractions are organic—Transitory contractions are inflammatory or spasmodic—Spasmodic stricture—Inflammatory—Organic and permanent—Reasons for adopting this classification—John Hunter's classification—Sir A. Cooper's—Pure spasmodic stricture very rare—Organic and permanent strictures constitute the chief portion of the subject—Meaning of the terms organic and permanent—Organic strictures must be studied from morbid specimens—The pathological anatomy here given deduced from examination of all the preparations in London, Edinburgh, and Paris—Simple or Linear stricture, bridle stricture—Annular stricture—Indurated annular stricture—Irregular or tortuous strictures—Number of strictures in one urethra—The elements of organic stricture—Interstitial inflammatory exudations—The tissues implicated in organic stricture—The mucous membrane—The sub-mucous tissues—The corpus spongiosum sometimes involved—Histological elements of the interstitial deposit—Its contractile tendency—Classification of organic strictures according to anatomical characters — Deposits upon the surface of the mucous membrane — Rokitansky's observations—Mr. Hancock's—Difference between superficial deposits in acute and chronic inflammations—Rokitansky's remarks—Observations by Guerin—Degree of contraction—Impermeability—Retention of urine does not depend upon organic impermeability—Obliteration of the urethra occasionally takes place—Is probably always of traumatic origin—Morbid changes in other parts resulting from stricture—Hypertrophy of the bladder—Sacculi of the bladder or cysts—Changes in the mucous membrane—Concentric hypertrophy of the bladder—Dilatation of the membrane—Dilatation of the ureters—Of the pelvis and calices of the kidney—Atrophy of the kidney—Dilatation of the urethra—Of the lacunæ, glands, and ducts—Ulceration behind the stricture—Urinary infiltration giving rise to abscess—Abscess may form without direct communication with the urethra—Course of abscess—Urinary fistula—Deformity, and thickening of parts from inflammatory deposit—Deposit of calculous matter—Results of sudden extravasation of urine—Views of the old surgeons respecting the causes of stricture—"Carnosities and Caruncles"—Such bodies do exist, although rarely—Hunter's observations respecting them—Sir Charles Bell's—Observations by Arnaud—By Morgagni—Pascal—By modern French authors—By Chelius—Preparations of them in the Museums—Case by Author—Rokitansky's experience—Mr. Norman—Mr. Guthrie—Description of a case—Nature of tumours in the anterior part of the urethra—Polypoid growths chiefly found in the prostatic portion—Rokitansky's observations on the formation of polypoid growths—Conclusions respecting growths into the urethral canal—Locality of stricture—Modes of determining locality, various—Observations by John Hunter, Home, Brodie, Liston, Phillips, Civiale, Amussat, Vidal, Ducamp, and Leroy D'Etiolles—Review—Why the bulbous portion of the urethra should be most frequently affected by stricture—Examination for the purpose of determining the question of locality—Three hundred preparations examined—1. Strictures at the sub-pubic curvature—2. Strictures at the centre of the spongy portion—3. Strictures at or near to the external meatus—Analysis—No prostatic stricture in any one of the Museums—Enlargement of the prostate not to be regarded as stricture.

WHAT IS A STRICTURE?

Stricture may be defined as an abnormal contraction of some portion of the urethral canal.

Numerous definitions have been offered by various writers, but all, with few exceptions, convey almost the same idea and the same extent of meaning.

Among the latter, Sir Charles Bell's may be noticed as one of the chief. Assuming the urethra to be in its quiescent state *a closed* canal, he defined stricture to be that condition in which it had "lost the power of dilating." There is no particular objection to be offered to the adoption of this definition. We have before seen that the natural closure of the urethra is due in part to the plicated arrangement of its membranous walls (well seen by making transverse sections of it), and that its patency may be as much the result of a mechanical unfolding of these which previously lay in contact, by pressure of the urine against them, as to dilatation of their component structures. So that whether a narrowed condition of the urethra be ascribed to *contraction* of that canal, or to its *inability to dilate*, is not very material. However, not to occupy space in useless discussions, I think that we are warranted to consider the former term more in accordance with the pathological facts about to be detailed, as well as shorter, and therefore more convenient for frequent use.

Contractions of the urethra are of two kinds. They possess a natural tendency either to be PERMANENT or to be TRANSITORY, as regards their character of duration.

A PERMANENT CONTRACTION is due to organic deposit in or around the walls of the urethra, and is accordingly termed organic or permanent stricture.

A TRANSITORY CONTRACTION may be due either to local vascular inflammation or congestion, causing temporary narrowing of some part of the urethra, hence INFLAMMATORY OR CONGESTIVE STRICTURE is spoken of; or, to unwonted muscular action alone, of the voluntary or of the involuntary fibres, in which case it is designated SPASMODIC STRICTURE.

Now this third condition, that of spasm, *may* exist alone, but in a very large majority of cases it is found to complicate the first and second varieties. A stricture is therefore described as *pure spasmodic* when such is not the case, and *mixed* or *complicated* when a permanent organic lesion is present and gives rise to some transitory contraction. The term spasmodic will be understood to include all cases in which involuntary contraction of the muscular fibres constitutes the *essence* of the pathological state, the word "spasm" being adopted as implying that action, to designate the class.

And, just in the same manner, when acute inflammation takes place in any part of the urethra, and the mucous membrane is rendered tumid, and the calibre of the canal is diminished, the *essential* element of the morbid condition being the inflammation described, this term is selected to denote the class. Spasmodic action may supervene, and, perhaps, frequently in such cases, because a common and adequate exciting cause of it, viz., inflammation, is present.

Again, when *organic deposits* have occasioned a stricture of the urethra, although both spasm and inflammatory action may be commonly occasioned here also at some time or another by its presence, the terms ORGANIC and PERMANENT are employed because they convey to the mind what are the *essential* causes and character of the contraction of the canal.

It will be necessary to state the reasons which have led me to decide on the classification of strictures here presented. Numerous modes of arranging their division have been suggested by various authors, comprehending in some only two, in others as many as seven divisions, while certain writers have not entertained any methodical distinction at all. These facts alone indicate the difficulty of forming a complete classification. Pure examples of any separate kind of stricture are so rare, that it is only by recognising a certain predominant character as the type of a series, that a class can be formed. Every individual example, perhaps, partakes more or less of characters which belong to all classes. Gradations exist, forming instances which it is almost impossible to classify. But thus it always must be with the phenomena of nature, whether they are the results of what we call normal, or of morbid actions, and we shall do well not to attach more importance to mere classification than it deserves, regarding it only as a useful but subordinate and imperfect means of contributing to the object we have in view, viz., the right and easy understanding of the subject under consideration.

John Hunter recognised three varieties of stricture, viz., "permanent," "true spasmodic," and "mixed, composed of a permanent stricture and spasm."* The difficulties just alluded to were apparently disposed of by the constitution of a mixed class, but, in fact, the classification was itself sacrificed, the two former being really merged almost entirely in the third. Thus he further remarks,—"There are very few strictures that are not more or less attended with spasms."† But, again, this arrangement leaves one direct agent in the production of strictures unrecognised, viz., acute inflammation. As we shall hereafter see, there are certain states of the urethra in which an attack of inflammation may suddenly supervene, occlude the canal, and, as a consequence, cause complete retention of urine, the mechanical cause being undoubtedly congestion of the vessels, and the outpouring of inflammatory products into the tissues around. This phenomenon cannot be included under the head of permanent stricture, since it by no means necessarily possesses that character; it may terminate by resolution, and leave the urethra as pervious as before. It is impossible, therefore, not to admit the existence of a class of inflammatory strictures.

This view was entertained by Sir A. Cooper. He says, "Strictures are of three kinds, the permanent, spasmodic, and inflammatory. The permanent stricture is the result of thickening of the urethra from chronic inflammation; the spasmodic arises either from a contraction of the muscles surrounding the urethra, or from the urethra itself; the inflammatory in consequence of inflammation of the acute kind, which generally succeeds the acute gonorrhœa."

Inflammatory and spasmodic strictures have been greatly confounded. By some they have been used as almost exchangeable terms. Either may become a cause of the other, and they most frequently co-exist. Still nothing can be more distinct than the two, of which fact we shall meet with ample proofs hereafter.

Examples of pure spasmodic stricture are without doubt very rare, still the influence of muscular action upon the urethra being considerable, it is important to recognise it in diseased conditions of the organ, since it commonly supervenes upon and complicates most of them. Indeed, neither organic nor inflammatory narrowing of the urethra can be well imagined to occur without the co-existence, at some time or another, of spasmodic action to some extent in the muscular tissues around.

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* Hunter on the "Venereal Disease," p. 163. † Ibid. p. 192.

It is not proposed to pursue the subject further here, for as the pathological explanation of the spasmodic variety can only be discovered by consideration of the symptoms during life, in connection with those anatomical facts respecting urethral structure already enunciated, we shall more advantageously inquire into its nature and causes in connection with the symptoms, and therefore postpone the investigation until these have been detailed.

But the pathology of organic or permanent stricture must be sought by reference to the diseased structure in the dead body, and our present duty will be an examination of those cases which belong to this class. They form by far the largest portion of the entire subject, are susceptible of more accurate and satisfactory demonstration as to their nature and action, are the most important in relation to treatment and results, and will accordingly occupy a corresponding share of attention in the pages before us.

In accordance with the definition of stricture which was proposed at the outset, the terms *organic* and *permanent* must be understood to include all contractions of the urethra which are the result of some appreciable organic alterations in the structure of the parts involved, excepting that which is due to, and concurrent with, an acute inflammation, capable of undergoing complete resolution, not necessarily followed by any *permanent* narrowing of the canal. It has been asked by some writers on this subject, who object to the classification here adopted, on what ground inflammation is not admitted by it to rank among *organic* changes. The answer is sufficiently obvious. Our language does not furnish us with a single term embracing the co-existence of two ideas, both necessary to describe the class of lesions under consideration; the one of organic change, as contrasted with what we call functional; the other, that its especial character is permanency, *i. e.*, inability to bring about its own resolution and cure by the working of any naturally inherent power: this being the rule beyond all question with regard to the strictures now under consideration; it being further understood that the absolute impossibility of an exception is not affirmed.

Acute inflammation narrows the canal for a time; but the great majority of inflammatory attacks under favourable circumstances leave the calibre of the canal as they found it. Acute inflammation, *per se*, is rarely a cause of *permanent* stricture: it is the subsequent persistence of the chronic form which is the great agent in its production, as we shall hereafter see.

On these grounds I should unquestionably be compelled, on all occasions, to use the words, *organic and permanent*, in combination, were it not conceived legitimate to employ either of them alone for the sake of brevity, having first stated that the other is always to be regarded as implied or understood.

PERMANENT ORGANIC STRICTURES present themselves in a great variety of forms.

No study of these can be really useful for practical purposes which does not embrace the examination of morbid specimens themselves. As the unrivalled collection which forms the Museum of the Royal College of Surgeons is rich in beautiful preparations, and as these are more generally accessible to the majority of readers than any other collection in existence, special reference will be made to any of them which may be required for demonstration, according to its number in the catalogue, descriptive extracts from which will be found in the Appendix, together with occasional remarks added by the Author. Some specimens in the possession of other Museums, both in this metropolis and elsewhere, will be also referred to, in order to enlarge and facilitate the reader's acquaintance with the subject, and where additional examples are required for purposes of illustration. In short, the pathological anatomy of organic stricture, detailed in the following pages, is to be regarded as, in a great measure, deduced from a close personal examination of more than three hundred preparations of stricture in the Museums of this country and of Paris, and of a number almost equal, of preparations of the bladder, kidney, &c., which illustrate concomitant morbid conditions, as well as from the observation of recent specimens in the dead-house, which has been enjoyed by the Author to a considerable extent.

VARIETIES OF FORM—LINEAR STRICTURE.—The urethral canal may be obstructed by a thin membranous diaphragm only, stretched across it, with an aperture in the centre, or, as is not unfrequently the case, placed near to any side of it, having an appearance, in relation to the rest of the passage, somewhat resembling that which the pyloric orifice of the stomach bears to the adjacent duodenum.[*] It occasionally happens that we meet with folds of the mucous membrane obstructing the passage at one of its sides only; this may occur above, below, or on either side, forming a crescentic septum, obstructing a segment of the calibre of the canal. Similar folds sometimes run obliquely instead of directly across it, all being, nevertheless, examples of linear contraction.

Such as these constitute the "bridle stricture" of Sir Charles Bell, a term alluded to here because it has become a rather popular one with writers on stricture, by some of whom it has been supposed to refer exclusively to those rare instances in which a free thread or band of lymph runs across the urethra from one side to the other, as if adhesion had occurred to a limited extent in the centre of the passage, and had afterwards gradually suffered extension, a construction which the original description by Sir C. Bell can by no means be made to bear. These free bands, however, do exist.[†] A remarkable specimen, in which ten or eleven are found in one urethra, is preserved in the Museum of St. Bartholomew's Hospital. It appears very probable that these are sometimes formed by the passage of instruments, and that they are, in fact, short "false passages." The appearance of one or two of those in the preparation referred to, gives this impression very strongly. It is exceedingly common to find that part of the urethra which lies behind the stricture more rugose than natural, especially in the membranous and prostatic portions; preparations may be seen in which it even appears almost fasciculated. These bundles may be readily detached with a small or sharp instrument, and this is suggested as a cause of some (it is not said of all) of these cases. Further illustrations of these remarks may be seen in three or four other preparations noted below.

ANNULAR STRICTURE.—Those instances in which the contracted part is a little thicker and broader than the foregoing description would include, have been termed "annular" strictures, examples which present an appearance as if a piece of cord had been tied round the canal at one point, leaving the remainder free. Excellent illustrations of this are presented in preparations referred to in the note below;[*] and a good instance is seen at fig. 2, page 66.

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[*] An excellent example is No. 2528 Roy. Coll. Surgeons.

[†] Specimens of these *free bands* may be found in St. George's Hospital Museum, No. S. 2. Bartholomew's Museum, Series xxx., No. 37, and Series xxvii. No. 28, the case referred to in the text. St. Thomas's Museum, D D, Nos. 7, 9, and 10. Royal College, Edinburgh, Nos. 2096, xxxii. D, and 2132 and 36, xxxii. F.

Indurated Annular Stricture.—In most cases of confirmed stricture, the induration is seen to extend into the tissues around the urethra, to the depth of half a line or a line; but is nevertheless limited in extent from before backwards, to a space occupying less than half an inch of the canal. The centre of the space is the point at which the contraction is most considerable, so that the affected portion presents a form somewhat resembling that of an hour-glass: and it is worthy of remark that the induration is generally thicker at the floor than on the upper aspect of the urethra. Such may be regarded as "indurated annular" strictures.

Irregular or Tortuous Strictures.—In a few instances, some of the natural rugæ of the urethra seem to be adherent, or even fused together, for the space of a few lines in length. In very rare cases we find something resembling a cicatrix in the form of a patch of indurated tissue, around which the mucous membrane is puckered, in lines more or less radiating from it; the amount of contraction appearing to correspond with the extent of previous loss of substance from some cause or another. But occasionally the contraction extends longitudinally for a considerable distance, and the canal is narrowed, and its walls thickened on all sides, for a length of one or more inches.[†] In these cases the induration extends deeply into the surrounding tissues, involving sometimes the entire substance of the corpus spongiosum, and giving rise to some of the most obstinate and undilatable strictures. Fig. 3, at page 66, represents such a case. In other instances, the urethra is irregularly contracted throughout almost its entire course; and every degree of variation is to be met with, between the condition in which the only obstacle within it is a small fold of mucous membrane, and that in which almost its whole length is more or less affected.

Number in one Urethra.—Occasionally several separate strictures may be observed in the same subject. John Hunter records an instance in which he met with *six* strictures in one urethra. Lallemand mentions one with *seven;* Colot saw one with *eight;* Ducamp says there are rarely more than two, but that he has seen *four* or *five*. Boyer thought *three* could exist together. A case is reported by Leroy D'Etiolles, in which he found *eleven;* but since this is sometimes quoted as if it were a post-mortem observation, it is necessary to state that this number rests only on the evidence afforded by the passage of an exploratory bougie (that is, a small gum elastic sound, with an olive-shaped extremity, two or three sizes larger than that of the stem) on the person of a *living* patient. The strictures, to use the author's words, were "*for the most part in the spongy portion, about two and a quarter lines distant from one another,*" a condition which would perhaps be better described as a series of irregular contractions, than by any statement of the exact number of the strictures. Rokitansky speaks of four, and does not record a higher number as having come under his own personal observation.

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[*] Royal College of Surgeons, Nos. 2529, 2537, 2539, 2540. N.B. A description of each preparation referred to in this and in all of the succeeding notes will be found in the Appendix, to which the reader is referred.

[†] Royal College of Surgeons, Nos. 2557, 2552, 2535 and 6. Middlesex Museum, xi. No. 10. Bartholomew's, Series xxvii. No. 28. Royal College, Edinburgh, Nos. 2108 and 9, xxxii. D.

My own researches have not led me to recognise numerous independent strictures in one urethra. Three, or at the most four, *distinct* contractions is the highest number I have been able to discover, but such instances are very rare. A few examples of urethra greatly contracted, from the meatus externus almost to the membranous portion, are in existence; but these do not exhibit a multiplicity of strictures so much as general thickening and coarctation of the canal.

The following questions are now presented for solution:—

What are the essential anatomical elements of organic stricture? And what are the structures in which the constriction itself is seated?

ELEMENTS AND SEAT.—Their consideration may be advantageously entered upon together. The first effect of inflammation upon the mucous membrane is a swelling or thickening of it, caused by engorgement of the vessels. Then exudation of an albuminous fluid takes place into its substance and especially into the tissues beneath, rendering them œdematous, all which matter is readily absorbed under favourable circumstances; and so far, we have the condition which exists in the mere inflammatory stricture, one of the transient forms of the affection because resolution readily follows. But when the morbid state persists, more or less of simple fibrillating lymph, or of fibroplastic material, are thrown out, meaning by the former term a fluid blastema, in which fibres make their appearance, apparently without any intervening cell production or agency;

and by the latter, an exudation, in which nucleated corpuscles appear, which soon elongate, become fusiform, and then fibrous. The ultimate result of these processes is, the formation of a firm fibrous tissue around the canal, which has the effect of gluing the mucous membrane to the submucous tissue, infiltrating the meshes of the latter, and even involving the investing fibrous coat of the corpus spongiosum itself; while repeated or long-continued attacks of inflammation may cause it to extend throughout the entire thickness of that body, rendering it tough and dense to an extent, in some cases, almost beyond belief. Sir Charles Bell describes the strictured part, in one of his preparations (now in the Museum of the College of Surgeons, Edinburgh, 2169 xxxii. G), as being "*as hard as a board*."

On laying open a strictured urethra after death, we shall accordingly discover that the structure in which the constriction itself is seated is by no means always the same. It may be in rare cases almost confined to the mucous membrane of the urethra, in which case it appears to be simply thickened, a condition which may be regarded as the primary and most elementary form of stricture; and the narrowing usually disappears when the section is made, leaving perhaps only a faint whitish line or two by which to indicate its situation.* There is no particular redness of the membrane or congestion of its vessels to be observed; yet there is good reason to believe that this exists during life, but that it disappears after death. Frequently the mucous membrane is seen to have lost its transparency and polish, to be thickened, indurated, or puckered, and on making a section of the strictured part slight implication only of the deeper tissues may be evident. It is, however, almost invariably more or less adherent to them, a condition which, during life, must in some degree tend to maintain irritation of the part from the straining which the membrane thus necessarily suffers during erection.

But most commonly a few transverse bands of whitish fibres are seen beneath the mucous membrane, encircling the urethra and narrowing it as if it were tied with thread. When these are cut, the mucous membrane is more or less set free; hence it is that a stricture which has been exceedingly narrow during life is often less obvious to the eye when the urethra is laid open after death, than would have been anticipated. The mucous membrane at the constricted point then appears narrower than the healthy part, but less so than one might have believed from the small calibre verified previous to the section of the urethral wall; and in some few cases it really appears not to have been altered in structure at all, but merely confined by the bands described.

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* Museum of College of Surgeons, No. 2528.

In more severe cases the meshes of the submucous cellular tissue are seen to be filled with lymph deposit, the presence of which destroys its elasticity and mobility, implicates the involuntary muscular fibres, which can no longer be traced, and extends to the proper fibrous coat of the spongy body. In the worst examples, the deposit even solidifies the erectile tissue itself, and constitutes the hard and unyielding mass already described. This condition is frequently apparent enough to the finger, when external examination is made in the course of the urethra during life, a nodular mass being distinguished surrounding it, in the situation of the stricture, so firm and resistant to the touch as to have suggested the idea that it might be a cartilaginous formation.* The same condition may be found affecting also the corpora cavernosa, when the whole body of the penis presents a hard, gristly, and knotted feel, and a deformed appearance when erect.

On examining under the microscope the organized materials which compose the stricture, we find the same structures as are presented by that solid infiltration of other parts which has resulted from the inflammatory process, forming a tissue already histologically described, which hardens, consolidates, and strongly contracts with age, but which has no tendency to undergo any spontaneous process of removal. After a considerable amount of research I have never been able to discover any yellow elastic fibres appearing to belong to this tissue; nor do I now think that they form any portion of it, properly speaking, although immediately beneath the mucous membrane they are always to be seen, forming one of the natural constituents of the part. The contractile properties of this inflammatory product are too well known to require much illustration here. Suffice it to say, that in the liver we find such interstitial deposit producing cirrhosis, or the "hobnail liver;" and another familiar example of its power may be found in that condensation of the lung, often observed to follow the contraction of the lymph poured out upon its surface in pleuritic inflammation. While the same structure, although formed under differing circumstances, may be recognised in the cicatrices following burns, the contractile tendencies of which are familiar to all.

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* Univ. College Museum, No. 815. Museum of Royal College of Surgeons, Edinburgh, No. 2114, xxxii. E.

ANATOMICAL CLASSIFICATION.—All the different forms and degrees of contraction hitherto described may, I think, be well comprised in four classes; an arrangement which is offered simply for the purpose of indicating a useful method of designating any specimen, according to the external *anatomical characters* of the stricture itself. It will then be only necessary, for the sake of further description, to speak of it as more or less narrow, and name the region in which it is situated.

CLASSIFICATION OF ORGANIC STRICTURES, ACCORDING TO ANATOMICAL CHARACTERS (AFTER DEATH).

I.—LINEAR STRICTURE :—

Narrowing caused by a single fibrous band, partially or wholly encircling the urethra outside the mucous membrane, a fold of which creates a degree of obstruction corresponding with the tightness of the band.

II.—ANNULAR STRICTURE :—

Narrowing caused by thickening of mucous membrane, or by bands external to it, embracing a notable portion of the urethra, not exceeding the fourth or the third of an inch.

III.—INDURATED ANNULAR STRICTURE :—

The preceding, with much indurated deposit, involving more or less of the corpus spongiosum, often appreciable by the finger from the external surface.

IV.—IRREGULAR OR TORTUOUS STRICTURES :—

The narrowing involves half an inch or an inch of the canal, which then usually deviates more or less from a right line. These may be *without* induration of tissues around, or *with* induration, appreciable by the finger, generally the latter.

In order to describe various kinds of stricture *during life*, their prominent pathological tendencies will best indicate appropriate terms; anatomical characters being then only partially appreciable; for such classification, see p. 100: for remarks on the *physiological* properties of stricture-tissues, see end of Chapter VI.

FALSE MEMBRANES OBSTRUCTING THE URETHRA.—A widely-differing condition to any of those above described has been referred to by some under the title of stricture. Sometimes, but by no means frequently, an exudative deposit upon the surface of the urethral mucous membrane, it is said, causes occlusion of the canal. Instances of this are certainly very rare. Few are on record, nor are many clear examples to be found in our museums. Rokitansky refers to them as follows:—"In very rare cases we find primary croup occurring on the urethral mucous membranes; it induces a circumscribed or a tabular exudation, according to the intensity of the process, and occurs chiefly in children."*

Mr. Hancock states that he has met with two or three instances. He describes them as consisting of delicate false membrane, possessing the characters of condensed cellular tissue, closely adhering to the surface of the mucous membrane, for perhaps an inch in length, sometimes requiring the aid of the microscope for its identification; and he moreover speaks to having seen three examples in which the posterior part of the deposit was loose, raised, as it might be supposed, by long-continued pressure of the urine upon it in micturition, until it had come to form a kind of semilunar valve, with its free border towards the bladder; an obstacle which it is easy to conceive might form a complete mechanical hindrance to the passage of the urine, and one which would act with greater power in proportion to the amount of fluid pressure exerted upon it from behind. A preparation exhibiting a faint resemblance to the condition described is to be found in Guy's Hospital Museum, No. 2402^{10}. There is another in the Musée Dupuytren of Paris. It bears Breschet's name, and is represented as a case of urinary retention depending on a "*valvule sigmoide*," situated about the bulbous part of the urethra. This was doubtless correct, but the preparation is old now, and does not exhibit it well.

One other which has such claim to belong to this category is a preparation of Sir Charles Bell's from a patient who died of extravasation. It now forms No. 2160, xxxii. G, of the Museum of the College of Surgeons, Edinburgh. (See Appendix.) But both in the first and last preparation referred to, the valve possesses, in my opinion, more the appearance of a dilated lacuna than that of a flap of false membrane.

Let it be remarked, however, that the real false membrane which is thrown out as a plastic exudation, is always, as in the respiratory track, the result of an inflammation of *considerable intensity*. Nevertheless there is a deposit occurring as a sequence of *chronic inflammation*, and which must be distinguished from the croupal form, since it is wholly different in its nature and origin, while I believe it not uncommonly constitutes the phenomena met with in cases of deposit upon the surface of the urethral mucous membrane.

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* Rokitansky, translated for the Sydenham Society, vol. ii. p. 235.

So pertinently does Rokitansky describe it, when considering, not this local affection in particular, but the subject of inflammations of mucous membranes in general, that it is impossible to do better than transcribe his own words. He says,—"Chronic inflammation leaves behind it a permanent tumefaction, or hypertrophy of the mucous membrane, and a continual excessive secretion of a grayish white and milky, or of a glassy transparent pasty mucus—a blennorrhœa, which may or may not be attended with an exuberant formation of epithelium, and in which, accordingly, the epithelium is either rapidly thrown off from an almost bare, and, as it seems, excoriated mucous membrane, or accumulates over the whole, or over parts, of the surface, and thus forms a complete laminated covering for it, or patches of various thickness here and there upon it."*

Sir Charles Bell recognised the formation of deposits upon the surface of the urethra as the result of inflammation occurring "as a consequence of stricture," observing that "the stricture itself not only increases, but the passage is apt to be further choked by a crust of a coagulable lymph which is deposited behind the stricture," and states that it "will become consolidated, apparently by successive attacks of inflammation there."† This condition is not unfrequently present, and may be seen by reference to several specimens of old stricture, in which such deposits are very obvious, in the dilated part of the urethra behind the obstruction.‡ This, however, it will be readily understood is not to be confounded with a croupal exudation from the urethra, and which I still believe to be extremely rare.

The opinion thus expressed in 1852, in the first edition, has been confirmed by the very numerous observations which I have been able to make in various quarters since it was originally given; and I have had the satisfaction of meeting with a singular corroboration of its accuracy in the results of the independent labours of another observer. M. Alphonse Guérin, chirurgien du Bureau central in Paris, has carefully examined 100 cases of diseased urethra after death, of which number about half were affected with stricture, and he has recorded his experience in a valuable paper recently published. He unhesitatingly asserts that he has never seen "the slightest trace of granulating tissue upon the surface of the mucous membrane; the plastic process has acted either immediately beneath the mucous membrane, or in the spongy tissue of the canal." He adds, "that in none of the numerous cases which he has examined has he found *any false membrane on the free surface* of the mucous membrane."*

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* Op. cit. vol. iii. pp. 51–2.

† "Treatise on the Diseases of the Urethra," &c., 3rd edition, 1822, p. 109.

‡ Royal College of Surgeons, No. 2576. St. Thomas's Museum, D D, No. 16. Univ. College Museum, Nos. 815, 2185, 2425.

The italics are those of the author himself.

DEGREE OF CONTRACTION—IMPERMEABILITY.—Speaking in general terms, the degree of contraction is proportioned to the duration of the complaint, and to the extent of the inflammatory action which is set up in the tissues around, giving rise to successive deposits within their substance; while, let it be remarked, the severity of the symptoms, the amount of distress, and the effects on the constitution, are not always, by any means, commensurate with the amount of abnormal narrowing which exists. It is very rare indeed to find the urethra altogether impervious during life to the flow of urine. However contracted it may be, it still issues either in a very small stream, or by drops. Retention does not depend on absolute organic impermeability. It is easy to conceive that when the canal is contracted to a mere pin-hole, the slightest cause may operate to occasion total obstruction; a little tumefaction of the part, a pellet of thick mucus, a flake of fibrinous deposit, or a very small calculus, is quite sufficient to block up the channel; and fatal consequences have been so caused.

But do the walls of the contracted passage ever adhere, and so cause obliteration of the urethra? Probably, never, unless fistulæ have been established, when, although very rarely, this accident may happen in that part of the canal which is anterior to the unnatural opening, and which is thus deprived of its function as an excretory channel.

Nevertheless, obliteration of the urethral canal does occur, but it is almost invariably of traumatic origin. The urethra may be cut across by a wound in the perineum, and for want of proper attention the urine may pass entirely through the artificial opening, and adhesion seal up the proper passage. But such obliteration is a wholly different thing from stricture, and ought not to be confounded with it. Its occurrence is by no means uncommon.

I have twice met with a stricture (properly so called) in the dead house, impermeable to a bristle or an eye-probe, even after the urethra had been slit along up to the point of contraction; urinary fistulæ were present. The preparation of one case should be now in the private collection of a surgeon in this city. The other occurred in my own practice; in this almost no urine passed for years, except by numerous fistulæ. At the post-mortem examination, although there was not absolute occlusion or obliteration, a probe of the smallest size could not be passed through the stricture. I had punctured the bladder three months before death, the only case in which I have done so for the relief of stricture and inability to pass an instrument during life. The cause in this case was not traumatic, but gonorrhœa in youth. (See Case No. 8., end of the sixth chapter.[*]) Three or four similar cases are to be found in the Museums,[†] but of none of these is it possible to say, for want of the necessary history, whether the occlusion has been the result of any disordered vital action, or of traumatic injury.

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* Des Rétrécissements du Canal de l'Urètre, par le Dr. A. Guérin. Mémoires de la Société de Chirurgie de Paris. May, 1851. Pp. 122 and 129.

Having considered the pathology of organic urethral obstruction, it is necessary next to notice somewhat in detail the various changes which arise in the genito-urinary apparatus, as its results and concomitants.

Just in proportion to the harmony and completeness which obtain in the human economy in the performance of its numerous functions, and in the innumerable relations which each part bears to every other, may be estimated the extent to which habitual deviation, however slight, from the normal performance of a common act, is likely to implicate injuriously other organs, and induce grave results in course of time. True, there is a wonderful power of adaptation in nature to altered circumstances; the self-protective resources of the body are often developed to an extraordinary and admirable degree. But let the abnormity be long continued, and in time the very process by which nature at first defends herself becomes itself a source of evil. These remarks might be illustrated from the history of organic disease in almost every part of the body, but perhaps in none more fully than from that of stricture and its consequences.

Hypertrophy of the Bladder.—One of the first results of permanent obstruction in the urethra is hypertrophy of the substance of the urinary bladder, proportioned in amount to the power required to overcome it. Perhaps, antecedently to this, might be reckoned a small amount of dilatation; the ordinary efforts of the viscus being insufficient to accomplish the act of micturition, some of its newly-exerted force tells upon its own walls and dilates them. But the compensating principle referred to soon affords the power; the muscular fibres are greatly augmented—the coats of the bladder are thickened throughout—and in time the fibres take the form of trabeculæ or columnæ, interlacing in all directions, and exhibiting an appearance which has been very aptly compared to that presented by the musculi pectinati of the right auricle, or by the interior of the left ventricle of the heart. To what extent this change may proceed, it is almost impossible to say. Preparations are exceedingly common in which the coats of the bladder measure from half to three quarters of an inch in thickness, and some even amount to one inch in places.[*] This chiefly depends on hypertrophy of the muscular fibres, although the same condition extends also to the areolar tissue which unites them, and to the mucous membrane as well, especially when there has existed much inflammation of the last-named structure.

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[*] A case of obliterated urethra, from injury, was exhibited by me at the Pathological Society, Dec. 20, 1853. See Trans., vol. v. p. 212.

[†] Guy's, Nos. 2412^{63}, 2405, and 2409. College of Surgeons, Edinburgh, No. 2139, xxxii. F.

Sacculi of Bladder.—As a consequence of the fasciculated arrangement which the fibres acquire, interstices of varying size are observed between the bundles. These depressions, which are sometimes very numerous, become deeper, and the mucous membrane being driven in by the fluid pressure which is exerted upon them, is apt, in course of time, to form pouches, which are sometimes of very considerable size. One of these, after long-continued dilatation, may at length form a receptacle for the urine, having a capacity as great or even greater than that of the original bladder. I remember to have seen a case in which relief to retention was given by puncture of the bladder through the rectum; a small quantity of urine only was drawn off. After death, which occurred in a few hours, one of these cysts was discovered still full of urine, of much larger capacity than the bladder itself. I exhibited at the Pathological Society, in

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[*] Such preparations are common enough in every Museum. For examples of the extreme cases referred to, see such preparations as the following :—Bartholomew's Hospital, Series xxx. No. 11. St. Thomas's, B B, No. 10. Guy's, No. 2412^{50}. Edinburgh College of Surgeons, No. 2021, xxxi. G.

1854–5, two cases that occurred in my own practice. In one, a sac existed capable of holding two or three ounces, the patient's age being only forty-two, although for many years the subject of severe and unrelieved stricture. In the other case, age sixty-seven, besides a large sac there were no less than fourteen smaller ones, varying in size between that of a pea and a marble.[*] As a rule, the "sac" or "sacculus" thus formed, is generally much thinner as regards its coats than the original bladder, and is composed of the mucous membrane, over which are irregularly distributed some muscular fibres and areolar tissue. Hence, rupture has been known to take place, attended, of course, with rapidly fatal results. A preparation illustrating this condition is No. S. 21, at St. George's Museum.[†] In some of these pouches it is not rare to find a collection of calculous matter, and in this manner are sometimes formed those encysted calculi which occasionally baffle the lithotomist.

Results of Inflammation.—Meantime, changes are going on in the character of the mucous membrane. Thus we find after death that it is thicker, presents a soft velvety or pulpy feel: its colour is heightened, or it assumes a dark or dirty red in place of the natural light yellowish pink. The free surface of the projecting columns or rugæ often exhibit a fine crimson hue, while the lateral parts of those projections which lie in contact show no such exaltation of the natural colour. In other examples circumscribed spots appear, which are evidently more congested than the rest; in places the mucous membrane may be abraded and preternaturally softened. Lymph is frequently deposited upon it, the result of inflammation, and adheres to its whole surface, whence it may be separated in a mass, or in patches of variable thickness.[‡] After death, by extravasation of urine, in some of the worst cases, large gangrenous spots of the membrane are seen of a greenish and blackish hue. More generally in severe and old cases, almost the whole lining presents a dusky

[*] Trans., vol. vii. p. 248, and vol. vi. p. 246.

[†] Preparations abound illustrative of these changes. Among the best and the most instructive are, Museum of the Royal College of Surgeons, No. 1983. Mus., Guy's, Nos. 2087^{50}, 2087^{75}, 2089. Mus., King's, No. 915. Mus., U. College, No. 1063, one of the most remarkable specimens extant. Mus., St. George's, No. S. 50, 51, 52, 70. S 21 is interesting, from death having been occasioned by the bursting of one of these sacculi into the peritoneal cavity. Mus., Bartholomew's, Series xxvii. Nos. 10, 28, 33. Mus., London Hospital, E. d. 47. Mus., St. Thomas's, DD. No. 4. Mus., Edinburgh College of Surgeons, xxxii. B, Nos. 2050, 2054, and 2074.

[‡] Bartholomew's, Series xxx. No. 12.

grayish hue, indicative of the chronic inflammation which has subsisted. Frequently a quantity of thick, tenacious, dark-coloured mucus adheres closely to the whole surface, and sometimes much fine calculous matter is mingled with it.*

CAPACITY OF THE BLADDER.—The capacity of the bladder may be either greatly diminished or increased. Instances of the former kind are not wanting, in which half, or, at most, an ounce of fluid must have filled the organ. In these, it will be found that much irritability has existed in it during life. The sensibility of the mucous membrane was so great, that for a long period the urine was discharged almost as fast as it issued from the ureter, and the bladder, never in any degree distended by its contents, became at length permanently contracted, while the spasmodic straining, which constantly attended the frequent calls to pass water, tended to increase the thickness of its parietes. On the other hand, where, the difficulty of micturition being considerable, the tolerant power of the viscus, as regards the urine, has not been diminished, the fluid has accumulated, and the reservoir has consequently been so habitually distended, that the bladder has become permanently dilated, and its capacity greatly increased, only a portion of the contents being lost at each act of micturition. In this case, hypertrophy of the walls always co-exists also. These results, however, are not so commonly seen in patients who suffer from stricture, as in those whose retention arises from enlargement of the prostate.

EFFECT ON URETERS AND KIDNEYS.—The process of dilatation, accomplished in the manner described, is not limited in its action to the bladder alone; the mouths of the ureters are soon distended, and little by little these tubes, which in health are about the size of a straw, grow more and more capacious, and actually become supplementary reservoirs for the secretion of the kidneys. They may be met with at any size, up to that of a man's thumb; and in very rare instances have been seen twice as large, and convoluted like an intestine. At the same time, their parietes sometimes increase in thickness, although this does not appear to be invariably the case. Then the pelvis and calices of the kidneys themselves are capable of suffering distension to an enormous degree; little by little the papillæ disappear, as the calices expand under the dilating influence of the accumulating fluid, until a capacious receptacle for it is formed. I have seen twenty ounces of urine evacuated from one; this, however, is a very unusual degree of capacity. A fourth, or a third of that quantity is by no means unfrequently found. But in a case which I presented to the Pathological Society in 1853, the distended pelvis of the right kidney measured seven inches in its greatest diameter, and the corresponding ureter two and a half inches.[*]

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* Royal College of Surgeons, No. 2557. Guy's Hospital Museum, No. 2091^{40}.

The pressure thus exerted upon the kidney tells sooner or later on the secreting substance of the organ, which becomes atrophied in consequence, and is reduced in thickness by degrees, until at length it totally disappears, and all that remains is a membranous sac.[†]

DILATATION OF URETHRA.—A very constant effect of this same pressure is dilatation of all that part which lies behind the stricture, and where the obstruction has existed for a considerable time this may always be noted. Its amount varies greatly. Frequently the forefinger, or at all events the little finger, may be passed from the bladder along the urethra up to the point of constriction. Rarely it is even larger. Sir B. Brodie's well-known and oft-quoted case is the most remarkable on record. Speaking of a patient, he says,—"The posterior part of the urethra was so much dilated, that whenever he made water, a tumour as large as a small orange, and offering a distinct fluctuation, presented itself in the perineum."[‡] The prostatic part, as was stated in the section relating to the anatomy of the organs, is the most dilatable portion of the passage, and usually exhibits a greater degree of expansion than the others. With this condition, also, it is occasionally observed, that the verumontanum has altogether disappeared, probably from the action of long-continued pressure.

This process of dilatation affects also all the natural openings into the urethra. Such are the lacunæ, and some of the larger glandular crypts, the prostatic and the ejaculatory ducts: all these are frequently found enlarged to many times their natural size; the former are more especially evident at and about the situation of the stricture itself. Pouches are thus formed capable of entangling the point of a sound or bougie; and it is worthy of note that they are generally situated on the *floor* of the urethra; sometimes calculous deposits are found in them. The sinuses, which lie on either side of the verumontanum, are also, in many instances, considerably deepened, giving that body an appearance of unusual enlargement or development, while the septa intervening between the dilated mouths of the prostatic ducts, often present the appearance of narrow fibrous bands crossing each other in all directions, forming a labyrinth or network exceedingly adapted to entangle an instrument, especially after it has been passed through a tight stricture, since the power of manipulating its point with delicacy is diminished by the grasp which the contraction exerts upon it. This condition, when existing as it frequently does posterior to the stricture, is well illustrated by the accompanying drawings, taken from two specimens in my own possession. One (fig. 2) exhibits, moreover, a good example of annular stricture; the other (fig. 3) imperfectly represents a long and tortuous contrac-

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[*] Trans., vol. v. p. 210.

[†] Some fine examples of these effects of fluid pressure on the kidney, &c., may be seen —Royal College of Surgeons, No. 1868. King's College.—A preparation described in the Appendix, without a number, is extremely fine. St. George's.—R. 5—an extremely remarkable case. Middlesex.—A preparation without a No. described in the Appendix. Effects unusually well displayed in the preparation: Edinburgh College of Surgeons, xxxi. F. Nos. 1992, 1975, and 1978. A good example of sacculation of the kidney, resulting from stricture, with the penis itself, accompanied this essay, and is now deposited at the College of Surgeons. It belonged to one of the Cases detailed at the end of Chapter X.

[‡] Op. cit. p. 8.

FIG. 2.

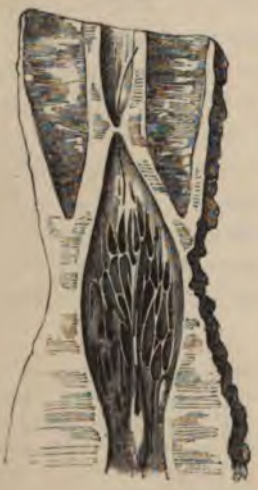

FIG. 2. This preparation accompanied the original essay, which formed the first edition of this work, to the College of Surgeons.

FIG. 3.

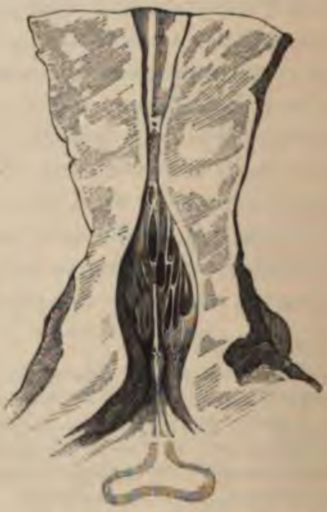

FIG. 3. This preparation is described in the Pathological Transactions, vol. vi. p. 245.

tion. Distension of the seminal ducts, and even of the seminal vesicles themselves, is occasionally met with, and disease may be set up in these parts from the irritation thus caused.[*]

Anterior to the stricture, the urethra is commonly observed to be rather narrower than is natural, but it is not always the case. Such narrowing might be supposed to result from absence of the ordinary pressure of a normally-sized stream of urine. When more than one stricture exists, there are sometimes inconsiderable dilatations between each.

Ulceration of Urethra.—Such are some of the mechanical effects of fluid pressure, acting upon the various points in the apparatus which are exposed to it. Besides the expansion or dilatation of the structures involved, another result is ulceration, commencing in the mucous membrane. The tissues themselves give way to the destructive agencies which slowly work upon them. First, the mucous membrane behind the stricture, at which spot it is closely adherent to the subjacent structures, strained and irritated by frequent acts of micturition, and by frequent, or indeed by almost constant contact with the urine, soon becomes the subject of chronic inflammation, an undue amount of its natural secretion is poured out, mixed with some pus, and it is soon denuded of its epithelial layer. Thus we find after death, that while the mucous membrane of the strictured part itself is opaque, white, and condensed, that which is immediately behind appears extremely thin, and is minutely injected with fine vessels, running for the most part in arborescent forms. Ulceration commences, and more unfavourable circumstances, for the occurrence of any healing process, can scarcely be imagined, than those to which the newly-made sore is thus exposed. It may extend either deeply or superficially. Examples of both kinds are to be met with; some in the form of large ragged excavations are ascribed to this cause in numerous preparations.[†] The ulcerative process may even occasion the destruction of the stricture itself. Of this also, illustrations may be found in the College Museum.[‡] Sir B. Brodie states that he has met with such in his own experience.

Abscess and Fistula.—Thus also one of the modes by which a degree of urinary infiltration may occur is explained. The irritation caused by the fluid which has escaped at an ulcerated part, perhaps in very minute quantity only at first, among some of the submucous tissues, gives rise to a small collection of matter, which becomes circumscribed by lymph-deposit, by very slow degrees enlarges, absorbs adjacent structures, and at length appears in the perineum. Left to itself, the integuments gradually redden and disappear before it, until a spontaneous opening takes place, and the matter is evacuated. A quantity of urine, more or less considerable, issues by the aperture, when the act of micturition is performed, and thus is established a urinary fistula, which gradually becomes more patent, and may at length become the main channel for the passage of the urine. Such is probably sometimes the history of a *fistula in perineo*, but it is by no means invariably so. An abscess may form in the neighbourhood of the urethra, without any previous lesion of the urethral walls, just as the same thing happens in the neighbourhood of the rectum without any direct connection with the gut, which, being opened by the surgeon, when evidence of its existence is presented, appears to have no communication with the canal at first. Two or three days afterwards, a few drops of urine make their appearance through the opening, and by-and-bye a larger quantity passes, if the stricture is not dilated. Had continuity of passage originally existed between the urethra and the abscess, urine would probably have been evacuated in the first instance. If permitted to take its course, an abscess sometimes breaks into the canal, admits urine into its cavity, and subsequently enlarges considerably on that account. If this be opened, or if it comes to the surface, as it may do in the course of time, fistula will follow of course. The route which these abnormal channels take is often very circuitous.* They may originate from any part of the urethra, and may open externally in any part of the scrotum or perineum, or even in the rectum, forming recto-urethral fistula. They are found sometimes passing through the glutæi muscles, and issuing at the nates, or among those of the thigh, or perforating the abdominal walls. A preparation, in which a urinary fistula traverses the thyroid foramen, exists in King's College Museum, No. 895. A remarkable case is preserved in the Museum of Guy's Hospital of a fistulous passage, in which almost all the urine issued by an opening at the umbilicus. In this case the remains of the urachus had evidently been opened up and dilated by the pressure of the urine. From all the points named, the greater portion, or indeed the whole of the urine, has been seen to pass.

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[*] Guy's Hospital Museum. No. 2398, 2407^{50}.

[†] See notes of preparations, Royal College of Surgeons, 2556, 2557.

[‡] Royal College of Surgeons, Nos. 2542, 2543. Bartholomew's, Series xxx. No. 32.

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* See notes of preparation, Royal College of Surgeons, No. 2555 particularly; six or eight other examples are quoted close by.

These fistulæ soon become lined with a pseudo-mucous membrane, which it is not necessary to describe here, and deposits of lymph take place slowly but extensively into the cellular tissue around them; their orifices are usually surrounded by some spouting granulations, and the neighbouring skin is reddened and thickened also from the passage of irritating fluid. When this condition has continued unrelieved for a long period, interstitial infiltration of the surrounding parts with inflammatory products often produces considerable deformity; the prepuce becomes distended with solidified deposits; the scrotum forms a large irregular misshapen mass of indurated matter, in which the penis itself may be almost buried. Abscesses are found in all the parts adjacent; in the erectile bodies; above and around the membranous portion; about the prostate, very frequently in the substance of this organ, which indeed is sometimes infiltrated throughout with pus, the whole of the proper tissue being disorganized; in the cellular tissue which surrounds the base of the bladder, or in the walls of the viscus itself, as well as in more distant parts, by the track of the fistulæ already described. Occasionally, from the constant passage of unhealthy urine through these intricate abnormal passages, the deposition of calculous matter is favoured at points of their course, generally at their commencement, and therefore near to the urethra, forming masses resembling mortar in appearance and consistence, imbedded in the substance of the tissues around the canal. So in cavities of the prostate the same formation is prone to take place.

EXTRAVASATION OF URINE.—When, as not very unfrequently occurs, any accident leads to the sudden and large extravasation of urine through rupture of the urethra during retention, or, as much more rarely happens, of the bladder itself, and which extravasations, therefore, are not limited by surrounding inflammatory deposits, as in chronic cases, all the appearances of active inflammation are presented, and these are followed by extensive sloughing of the skin, cellular tissue, and the structures of the penis and scrotum and adjacent parts. The appearances which are commonly exhibited in such instances need not be given in detail here; reference to the reports of Cases at the end of Chapter X., in which the post-mortems have been on this account reported, will give a truthful idea of the kind of lesions usually met with under these circumstances. The variations which may be presented by different cases will appear not so much in the nature as in the extent of those lesions. It should be remarked here that the agency of mechanical distension is to be regarded as secondary in giving rise to rupture, whether of the urethra or bladder. The primary morbid action being unquestionably ulceration and sloughing of the tissues in contact with the decomposed and concentrated urine, such processes being the consequence of that unhealthy inflammation to which the presence of irritating matters has given rise.

Growths in the Urethra. — In the writings of the old anatomists and surgeons, we find the symptoms of stricture attributed to a pathological condition very different from that which greater opportunities of prosecuting researches in morbid anatomy have led modern observers to recognise as their most frequent cause. They supposed that the flow of urine was interrupted by some growth into the urethra, analogous to those found in mucous canals elsewhere, and accordingly they named these supposititious bodies, "*fungi*," "*carnosities* or *caruncles*," and "*excrescences*," and presented them as the common cause of urinary obstructions.*

In a very small proportion of cases these bodies certainly do exist, and I have considered it legitimate to include them as a class under organic stricture, a position which their nature and origin entitle them to bear. Their rarity, however, must be inferred, not only from their very infrequent occurrence among the preparations in our Museums, but also in the records of their experience, which later anatomists have left respecting them. Among these I shall briefly refer to some whose observations may be implicitly relied upon.

Hunter states that he met with only two cases; one of them forms Prep. No. 2577 in the Royal College of Surgeons' Museum, there called "caruncle."

Sir Charles Bell saw them occasionally, and figured, in Plate IV.

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* They were so regarded up to about the close of the seventeenth century: Brunner, Physician to the Elector Palatine, 1690, and subsequently Dionis, believed stricture to be generally due to cicatrix following an ulcer, an opinion which was very generally received until late years.—*Cour. d'Oper.*, Dionis; 2nd ed., Paris, 1716, 3^{ieme} Demonst.

fig. 1 F, of the "Engravings from specimens of morbid parts," &c., "certain little white bodies like caruncles." In this plate they are five in number, and vary in size from that of a grain of rice to that of a small pea. They are situated in the bulbous part of the spongy portion. In Plate V. fig. 5, are "little warty excrescences," stated by the author to be "very imperfectly represented by the engraver." In this preparation there are two or three strictures, and these bodies are behind that which is last or farthest from the external meatus.

Arnaud, in his work published in London in 1769, Observation 10, describes at length a case in which there existed "a polypous excrescence which came out of the urethra near half an inch long . . the vegetation was red, fibrous, softish, and almost filled up the orifice of the urethra." Two other cases are recorded in the same work.

Morgagni, in his forty-second letter, speaks of having met with only one in many examinations.

Pascal, in his "Treatise on Gonorrhœa," article 3, gives the history of two soldiers, patients in the hospital of Milan, in 1718, whose urethras were found after death filled with fungous and callous excrescences, a condition which he states to have been the cause of their death.

Among more recent authors, Desault never met with a single example during the whole of his experience.[*] On the other hand, Amussat, Civiale, Lallemand, and others, have met with them: the first-named exhibited, on one occasion, a fine specimen to the Academy of Medicine of Paris. Velpeau has met with two cases only. In both of these he describes them as vascular excrescences situated just behind the meatus urinarius. Ricord has not unfrequently met with them: his description is similar. Mercier has seen one remarkable example, in which 12 or 13 little excrescences, each about the size of a barleycorn, and having a narrow pedicle, were found between the prostatic portion of the urethra and the external meatus.[†] Chelius states that he has met with only one case; in this the fossa navicularis was the part affected. Leroy D'Etiolles records three instances, in one of which he observed an excrescence the size of a pea, after death; the other two were cases in which he removed them during life. He also figures one in his work, and remarks, respecting these growths in general, that when situated near to the neck of the bladder they assume the form of little polypes, and that in the remainder of the canal they have a similar appearance to the vegetations which are common upon the surface of the glans penis. This remark receives some support from the appearances presented by the very few specimens of polypoid growths preserved in the Museums of the metropolis. One only exists in the Royal College of Surgeons, namely, Preparation No. 2000. In this they are confined to the neck of the bladder and the prostatic portion of the urethra, the remainder of which is entirely free. One of the best examples is to be found in the Museum of Guy's Hospital, where it forms Prep. No. 2411. In this case a single growth, measuring about nine lines long by three or four broad, springs from the junction of the membranous and prostatic portions. It gave rise to the symptoms of stricture during life, and appropriate treatment was employed. Fig. 4 represents it of the natural size.*

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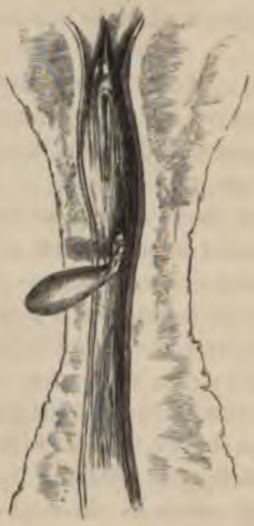
[*] Œuvres Chir., tome iii. p. 270. Paris, 1803.

[†] Recherches Anat. Path. et Thérap. sur les Maladies des Organes Urinaires et Génitaux. Par L. Auguste Mercier. Paris, 1841, p. 121.

FIG. 4.



A very fine example of tumour springing from the verumontanum, resembling in every respect the simple polypoid growths which are so commonly found in connection with the mucous membrane of the pharynx and nares, I lately met with in the prostate of a man, aged 54 years, a patient in the St. Marylebone Infirmary. The only sign of its existence, which could be ascertained during life, was an increased frequency of micturition. It is fully described in the Transactions of the Pathological Society of London, vol. vii. p. 250, and is now in my own collection. It is represented of the natural size at fig. 5.

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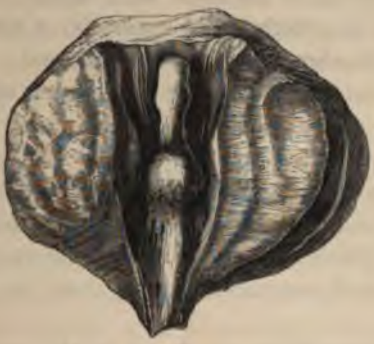
* See also No. 2578. In Bartholomew's Hospital Museum, Series xxix. No. 9, and Series xxx. No. 13. Middlesex Hospital Museum, No. xl. 2. St. Thomas's Museum, B B, Nos. 8 and 9.

FIG. 5.



Rokitansky states "that polypous or condylomatous growths of the urethral mucous membrane are a consequence of gonorrhœa, but that he has observed them very rarely."

Mr. H. B. Norman, in the "London Journal of Medicine," vol. i. 1852, records a case which occurred in the practice of Mr. Erichsen, of University College Hospital, the description of which is furnished by the latter gentleman. As it is brief and pertinent I cannot do better than transcribe it, more especially as the subject of it seems to have been typical of this class of tumours. He says, "Robert M——, æt. 21, came to the hospital for stricture. On examining the urethra I found a bright red and very vascular growth situated within the urethral orifice. It was nodulated, raspberry like, and bled on being touched. Its attachment was not pediculated, or but very slightly so, and the growth, which was about the size of a small cherry-stone, lay entirely within the urethra."

Mr. Guthrie has seen several such near the orifice of the urethra, measuring from about a quarter to half an inch in length, and resembling a bunch of granulations. He has not seen tubercles or caruncles affecting the urethra to any extent, at any other part, after death.

Lastly, of these latter kind, I have met with one case, a granular growth springing from behind the urethral orifice, and sprouting from it externally, in the person of a young man, in whom it appeared after neglected gonorrhœa and balanitis, and was accompanied by a small crop of warts on the surface of the glans, to which in point of structure it bore a strong resemblance, although its colour was a deeper red: but in the examination of many strictured urethras in the dead-house, it has never been my lot to meet with anything which could be strictly called *caruncle;* a roughened granular condition of the membrane is not so uncommon; thickened it may be in places occasionally, but not a specimen of which it could be affirmed that it was an example of the kind under consideration.

Other instances might very probably have been adduced, but enough has been done to show how rarely do these growths occur to interfere with the course of the urine, few surgeons having in their own experience encountered more than two, or at the most three examples.

The nature of those which are found at the anterior part of the canal, and which appear almost confined, as regards situation, to the fossa navicularis, appears to be something like that of exuberant granulations elsewhere, but partaking more or less of that of florid vascular tumour also. They are usually soft, and of a rose-red colour. They bleed very readily, and are not very sensitive. They seem related to the vegetations which are wont to flourish so luxuriantly upon the glans penis and neighbouring parts, but are more vascular, and are covered by a thinner cuticle, as being more protected by situation. The close proximity of their bases to the erectile tissues beneath, may be very reasonably supposed to be the cause of their peculiar vascularity. That they are, but more rarely, to be found in the posterior parts of the canal, is proved by some of the preparations referred to. Evidence exists also to render it highly probable that they are sometimes the source of hæmorrhage there when instruments are passed.

On the other hand, almost all the specimens of the more strictly polypoid growths which I have been able to see are confined to the prostatic portion, and are frequently accompanied by others at the neck of the bladder or within it, to which latter, indeed, they then have the appearance of being secondary formations, and they are more frequently found affecting only the lining of the bladder, and not that of the urethra at all. In such cases their structure amounts to little more than hypertrophy of the mucous membrane. Rokitansky's observations on the origin of polypoid formations of the mucous membranes in general, are worthy to be quoted here. Having described some of the effects of chronic inflammation on a mucous membrane, he adds, "Sometimes, from the great increase in the size of its papillæ and follicles, it is warty and rugged; and lastly even duplicatures and prolongations may be found upon it. The two last-mentioned inequalities of the membrane are permanent, immovable folds of the membrane; they constitute what is called the mucous or cellular polypus, or the vesicular polypus. These polypi are processes of the mucous membrane of various thickness and length. In shape they are spheroidal or elongated, or like nine-pins or cylinders, and their free extremity is thick and blunted. The mucous membrane and the tissue beneath it becoming hypertrophied at particular round circumscribed spots, form a somewhat flattened convex tumour, and progressively change into a honey-combed cellular tissue. Little by little the tumour drops into the cavity of the organ, dragging with it the surrounding mucous membrane, by which, as a comparatively thin and more or less elongated pedicle, it remains attached. . . . . . Polypi do not occur with equal frequency in all mucous membranes. They are especially frequent upon those membranes and parts of membranes that are bulky and thick, and that have abundance of follicles, and that are frequently attacked with catarrh."* In enumerating the localities liable to be their seat, the author places the urethra almost last as regards frequency. Accepting the mechanical process which he thus details as their common mode of origin, a reason not given by him why the urethra should be so seldom the seat of such growths, will readily appear to the reader, viz. the close approximation of its walls to each other, since it appears that the existence of a free cavity in which they can become pendant, is almost necessary to their development. Hence we find them only in the prostatic part, and there usually tending towards the bladder or pendant within it. Lastly, in some instances they appear to be associated with enlargement of the prostate. It is not uncommon to find a pedunculated growth springing from that organ, a section of which proves it to contain some of the same glandular structure as the prostate itself.

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* Op. cit. vol. iii. p. 52.

The conclusions to be drawn from the facts at present in possession respecting growths into the urethral canal are—

First, that while a granular condition of the mucous membrane is not unfrequently found in the neighbourhood of old stricture, particularly behind it, the existence of any excrescence so large as to attract observation as an independent growth obstructing the urethra, is extremely rare.

Secondly, that these bodies consist either of *vascular granulations* already described, of *ordinary granulations* sometimes found springing from an abraded or ulcerated surface of the mucous membrane behind a stricture, of *polypoid formations* peculiar to the prostatic part of the urethra, and very rarely of masses of *tubercular* or *cancerous* origin.

Thirdly, that the first and second varieties are much more common than the third, and that as regards tubercular and cancerous deposits, their occurrence is always secondary to the prior affection of other portions of the apparatus, not having been observed as primary formations in the urethra, on the contrary, rarely appearing until the disease has largely affected other portions of the urinary organs.*

LOCALITY OF STRICTURE.—There is some discrepancy in the statements of authors as to the part of the urethra at which stricture is most frequently situated. In order to arrive at a correct view of this disputed point, it will be necessary first to record and analyze the statements of those whose authority is most to be relied upon. I shall, therefore, as heretofore, record, first, the labours of others, whose accuracy and opportunities for observation have been undoubted, and then state what I believe to be the true conclusions which these, coupled with my own researches, have enabled me to arrive at.

The first thing to be borne in mind in comparing the experience of different authors on this subject is, that some give measurements of the distance in inches at which the stricture is found from the meatus externus, made after death, while the measurements of others are taken during life by passing an instrument down to the point of obstruction. How much difference must appear in the results of the two modes, may be inferred from the discrepancies already observed, in applying them to ascertain the average normal length of the urethra. We then saw that the canal is naturally one inch less in the latter than in the former condition, and that by stretching it, inadvertently or otherwise, that difference might be readily doubled. Again, some authors, knowing that the length of the canal, and even the relative proportions of its several parts, vary in different individuals, have not applied such measurements at all, but have specified the locality by its anatomical designation. This is by far the better mode of proceeding with regard to the examination of post-mortem cases, and is less liable to error; it is not, however, wholly free from it, unless very carefully done, or unless the eye be well practised in the habit of marking appearances, both in the healthy and the diseased urethra. The alleged topography of a stricture during life is rarely to be depended upon, unless it be regarded as involving a statement which is only approximatively correct.

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* Illustrations of these remarks will be found in the Royal College Museum, Prep. No. 2010; St. Thomas's, B B, Nos. 17 and 19.

The following extracts are made as brief as possible, consistently with the transference of the author's opinions to these pages:—

From John Hunter:—"Every part of the urethra is not equally subject to stricture, for there appears to be one part which is much more liable to them than the whole of the urethra besides, *i.e.*, about the bulbous part. We find them, however, sometimes on this side the bulb, but very seldom beyond it. I never saw a stricture in that part of the urethra which passes through the prostate gland."*

Sir E. Home.—"Strictures occur most commonly just behind the bulb of the urethra; the distance from the external orifice being six and a half or seven inches; the situation next in order of frequency, is about four inches and a half from the orifice of the glans; they do occur at three inches and a half, and sometimes almost close to the external orifice."†

Sir B. Brodie.—"In the majority of instances, the disease began in the anterior portion of the membranous part of the urethra, behind the bulb, and in the situation of the triangular ligament of the perineum; that in some instances it had its origin in the urethra, somewhere between the part just mentioned and the external orifice, and that in a few cases it is confined to the external orifice, and the canal immediately adjoining to it."*

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* Op. cit. p. 165.

† Op. cit. vol. i. pp. 26–7.

Mr. Liston.—"The passage is contracted at various parts; most frequently at about four inches from the meatus, but sometimes much nearer, and even close to it. The urethra is often enough narrowed as it passes through the deep fascia, betwixt its sinus and the apex of the prostate."†

Mr. Shaw.—"I have not, in more than a hundred dissections which I have made of diseases of the urethra, seen a stricture or narrowing of the canal, posterior to the ligament of the bulb; nor have I been able to find one example of stricture beyond this part among those preserved in the College Museum."‡

Sir Chas. Bell expresses exactly the same opinion.§

Mr. Benjamin Phillips.—"In a hundred and seventy-three cases which I have selected, the disease was seated at the following distances from the orifice of the urethra:—

"In 9 the distance did not exceed 1 inch.
,, 8 from . . . . 1 to 2 inches.
,, 13 from . . . . 2 to 3 ,,
,, 11 from . . . . 3 to 4 ,,
,, 98 from . . . . 4 to 5½ ,,
,, 40 from . . . . 5½ to 6½ ,,
,, 10 from . . . . 6½ to 7½ ,,

. . The disease, when at a greater distance from the orifice than four and a half inches, was seated either in the neighbourhood of the curvature of the urethra, or between that point and the prostatic portion of the canal, and that the difference in admeasurement was dependent on the length of the organ."‖

Civiale.—"The only regions of the urethra where one finds true organic strictures are these:—

"1. The external orifice.

"2. The two extremities of the fossa navicularis.

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* Op. cit. p. 4.

† "Practical Surgery," 4th edition, p. 468.

‡ A paper on "Stricture," by John Shaw. Med.-Chir. Trans., vol. xii. 1823.

§ Treatise on Diseases of the Urethra. By Sir Chas. Bell. 3rd edition, p. 184. London, 1822.

‖ "A Treatise on the Urethra." By Benjamin Phillips. London, 1832, pp. 149–50.

"3. The anterior region of the spongy part.

"4. The sub-pubic curvature at the junction of the bulbous and membranous portions.

"In other terms, the strictures occupied sometimes the extremity of the urethra, sometimes the region, of which the depth varies from one to three and a half inches, and sometimes a part five inches deep."*

Amussat "finds that the most common seat of the disease is in front of the junction between the bulb and the membranous portion."†

Vidal.—"At the junction of the membranous and bulbous portions, rather towards the first, it is that true contractions most frequently occur."‡

Ducamp says, "that in five cases out of six, strictures are found at between four and a half and five and a half inches from the meatus, ranging between four inches nine lines, and five inches three lines."§

Leroy D'Etiolles.—"Nineteen-twentieths of strictures exist at a depth which varies from five to six inches, that is to say, immediately behind the bulb, at the commencement of the membranous portion. . . . .

"In the second order of frequency are the strictures of the posterior lip of the navicular fossa.

"In the third order are those of the urinary meatus.

"In the fourth order come strictures of the spongy portion, situated at two inches to two and a half from the urinary meatus . . . . . I have also myself observed stricture in the prostatic region, and one may see a specimen in my collection."‖

Ricord also affirms that he has met with prostatic stricture.

In reviewing the observations recorded above, and bearing in mind the remarks on the modes of measuring made at the outset, we shall have little difficulty in reconciling what would otherwise be discrepant statements. With one exception, all the authorities quoted nearly agree in one particular, viz., that stricture is most commonly found at the sub-pubic curvature. At the same time, it is obvious that the opinions cited are not generally based on precise anatomical examination. Mr. Shaw's observation must be excepted. His statement, the result of numerous dissections, is strikingly precise, and in accordance with all modern experience. No doubt can exist as to the fact that organic stricture is almost invariably limited to that portion of the urethra which is anterior to the deep perineal fascia. In harmony with this also, observation demonstrates that the two spots which suffer most from gonorrhœal inflammation are the fossa navicularis and the bulb; I have had opportunities of observing this two or three times in the dead-house, on the bodies of patients who had been suffering from gonorrhœa shortly before death. Unusual vascularity is found in the latter situation, particularly if the affection have been chronic, while the intermediate part appears comparatively very little affected. Rokitansky corroborates also the truth of these observations. Speaking of urethritis, he says:—

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* "Traité Pratique sur les Maladies," &c. Paris, 1837, pp. 124–5.

† "Leçons sur les Retentions d'Urine," &c. Paris, 1832.

‡ "Pathologie Externe," tome v. p. 52. 2nd ed. Paris, 1846.

§ "Traité des Retentions d'Urine," &c. Paris, 1822.

‖ "Des Rétrécissements de l'Urèthre," &c. Paris, 1845, pp. 82–3.

"The inflammation is either uniformly diffused over the urethra, or is limited to one or more spots. The latter is especially the case in genuine gonorrhœa of the male urethra; we here find not only the navicular fossa, but every point as far as the prostatic portion, *and especially the vicinity of the bulb*, liable to become the seat of the disease."*

There is a preparation in the Museum of St. George's Hospital, which exhibits the urethra of a patient who died while suffering from gonorrhœa, in which an ulcer exists (the only one to be seen), in the commencement of the membranous portion.

M. Guérin, before quoted, ingeniously suggests that the reason why the bulbous part is so subject to stricture is to be found in the fact that the corpus spongiosum is larger and more vascular there than elsewhere. The amount of inflammatory effusion may be assumed to correspond with the amount of blood supplied; hence the deposit of lymph will be more abundant in the vascular bulb than in front of it.†

From Mr. Phillips's researches, which have been made with a direct view to the solution of the question of locality, it must be inferred that the contraction, when not situated absolutely at the anterior layer of the deep perineal fascia, is more commonly found before than behind it, and existing consequently in the bulbous portion itself. The statement which differs most widely from this is that of Mr. Liston, which declares a part of the urethra about four inches from the external meatus to be the most favourite situation for stricture. His words are, however, evidently intended, from the connection in which they appear, to apply to the *living*, and not to the dead subject; the expression is manifestly not designed to convey the result of any accurate researches founded on measurements, but merely to convey a general impression respecting his own experience. The difference, therefore, after all, is rather apparent than real; the locality which he indicates being that which the results of investigations about to be described prove to be, not absolutely first, but very nearly so, in degree of liability to the affection in question.

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* "Pathological Anatomy." Sydenham Soc. (translated by Dr. Day). Vol. ii. p. 233.

† Mémoires de la Société de Chirurgie, May, 1854. Paris. P. 131.

My own examination has included a very large number of cases. Ample proof of the extent to which these researches have been carried, will be found in the examples cited in the Appendix, and in the references there made to preparations in almost every public Museum in the metropolis; to those in the Museum of the Royal College of Surgeons, Edinburgh, which comprises Sir Charles Bell's collection, as well as to the very few contained in the Musée Dupuytren of Paris, which nevertheless contains all the examples preserved in that city.

These observations lead me to coincide, beyond all doubt, with the opinions just quoted, which assign the first place, in relation to frequency of occurrence, to the stricture which occurs at the posterior part of the spongy portion of the urethra. It has been already shown, that the only method of conveying a correct idea respecting locality, is to identify the contraction with the anatomical regions of the urethra, and not to trust to measurements from the orifice simply. This principle has therefore been adopted as the basis of the classification of strictures, in respect of situation, which is offered here. After much consideration of the subject, I have deemed it best to make as few classes as possible, consistently with an accurate representation of the facts exhibited. And the formation of these classes, be it remarked, does not result from a merely arbitrary division of the urethra, but certain natural indications have been followed, inasmuch as some portions of the canal are unquestionably liable to be much more affected than others.

In examining the Museums named, I have personally submitted to a close and careful inspection not less than three hundred preparations of stricture of the urethra, of which I possess notes made on the spot of two hundred and seventy, the rest being examples which,

FIG. 6.

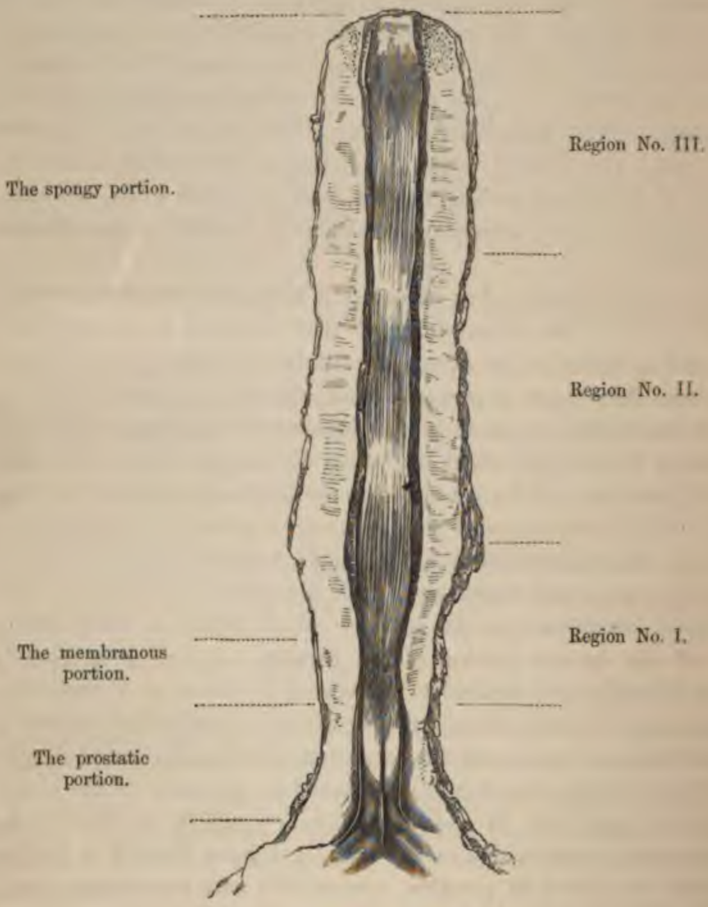

FIG. 6.—A healthy urethra, eight inches and a half in length, slit up from the upper part, accurately reduced on scale from a drawing made from the original while fresh, to half the natural size. On the left-hand side are indicated the anatomical divisions of the urethra, and on the right the boundaries of the regions referred to in relation to the locality of stricture.

from decay or other circumstances, it was impossible correctly to classify.

These examples may all be comprehended by the three following classes.

I.—STRICTURES OCCURRING AT THE SUB-PUBIC CURVATURE, *i.e.* at the junction between the spongy and membranous portions and its neighbourhood; the latter term being understood to comprise an inch of the canal before, and three-quarters of an inch behind, that point, thus including the whole of the membranous portion.

That part of the urethra which is most frequently affected with stricture is the portion comprised in the inch anterior to the junction, that is, the posterior or bulbous part of the spongy portion. The liability of this part to stricture appears to diminish as it approaches the junction, where it is less common; while behind, it is very rare. Most rarely is a stricture found so far back as the posterior part of the membranous portion.[*]

[Careful re-examination has led me to modify an opinion expressed in the first edition, that the junction itself was more frequently affected than the part about an inch anterior thereto. The more closely we examine preserved specimens, the more we must be convinced that stricture has been described by most authors as existing much behind its true situation. The passage as it stood in the first edition is as follows:—"The junction itself is the point at which stricture is most frequently situated. Next is the extreme anterior boundary of the division, a spot which is one inch in front of the preceding, and almost as frequently affected; whilst, between these two points, six examples of stricture are met with for every one behind the junction, in which latter situation they are therefore very uncommon."]

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[*] Such an one exists in the Museum of St. Thomas's Hospital. The preparation is numbered DD. 3.

It is extremely important to remember that the word "membranous" is very inaccurately employed in Museum catalogues, and especially in that of the College of Surgeons, in describing the situation of stricture. Mr. Shaw, in 1823, did not recognise one example there. Sir Charles Bell held the same opinion. The only examples which, after a very close examination, appear to be strictures of the membranous portion, are Nos. 2553 and 2560.

A recent writer, Mr. H. Smith, publishes a record of eighty-five cases in the Museums of London, of which he claims eighteen as situated in the membranous portion. (Stricture of the Urethra. London, 1857, p. 30.) In connection with this statement, Mr. Smith makes no allusion to my researches, previously published, which embraced more than three times that number, nor the fact which I maintained as their result, viz. the great rarity of membranous stricture. In self-defence, therefore, and in the cause of scientific truth, I am compelled now to re-assert the correctness of my original observations, and to state that the result which Mr. Smith has arrived at can only be attained by a summary of the printed descriptions of the catalogues—certainly not by an examination of the preparations themselves.

In the Appendix to this work, the necessary corrections are added to the descriptions quoted from the Hunterian Catalogue.

II.—Strictures occupying the Centre of the Spongy Portion, *i. e.* a region extending from the anterior limit of the preceding, to within two inches and a half of the external meatus, and measuring therefore about two and a half to three inches in length.

III.—STRICTURES OCCURRING AT THE EXTERNAL ORIFICE, AND WITHIN A DISTANCE OF TWO INCHES AND A HALF OF IT.

The following is an analysis of the 270 preparations referred to; they exhibit 320 distinct strictures:*—

Total number of strictures, 320.
,, In Region I. . . 215 or 67 per cent. of the entire number.
,, ,, II. . . 51 ,, 16 ,, ,, ,,
,, ,, III. . . 54 ,, 17 ,, ,, ,,
—
320

Of these—

There were 185 examples of *one stricture only*, situated in Region I.
,, ,, 17 ,, ,, ,, ,, Region II.
,, ,, 24 ,, ,, ,, ,, Region III.
There were 8 *cases* in which the urethra was strictured in all three Regions.
,, ,, 10 ,, ,, ,, ,, ,, in Region I. and II. only.
,, ,, 10 ,, ,, ,, ,, ,, in Region I. and III. only.
,, ,, 13 ,, ,, ,, ,, ,, in Region II. and III. only.

Lastly.—I may confidently assert that there is not a single case of stricture in the prostatic portion of the urethra, to be found in any one of the public Museums of London, Edinburgh, or Paris. I am disposed to believe that some observers have been deceived in reference to it, or that it owes its supposed existence to inferences drawn from the results of examinations of the living body, which can by no means be admitted as evidence on this subject. Two specimens only of the whole number have at any time been regarded as liable to be considered prostatic stricture. These are No. 3 DD., St. Thomas's Hospital Museum, and No. 2110 xxxii. E., of the Museum of the Royal College of Surgeons, Edinburgh; to the notes respecting which, in the Appendix, the reader is referred. At present, therefore, the existence of prostatic stricture appears to rest on the observations of Leroy D'Etiolles and Ricord.* Its excessive rarity, to say the least, is at all events demonstrated.

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* The numerous and valuable preparations of strictured urethra contained in the Museum of the Royal College of Surgeons in Dublin have been carefully examined by Mr. Walsh of that city. That gentleman's report appears in a note to a course of lectures edited by him, which appeared in the "Dublin Medical Press" in the commencement of 1856, and I have been much gratified at observing that it very nearly corresponds with my experience as given in the text. Mr. Walsh says, "I find the seat of stricture to be as follows:—$\frac{2}{3}$rds are situated at the anterior part of the bulb; $\frac{1}{6}$th at the orifice of the urethra; $\frac{1}{8}$th about two inches from the orifice; $\frac{1}{9}$th at four inches from the orifice; and $\frac{1}{12}$th at the membranous portion. There is one preparation which I think should be mentioned, on account of its rarity, and because the situation of the stricture is generally denied, viz. a stricture commencing in the posterior part of the membranous portion, and extending into the prostatic portion, causing a well-marked stricture there.

"By arranging the collection in our Museum according to Mr. Thompson's division of the urethra, we have the most frequent situation of stricture in the first division; the next in the third division; and the least frequent in the second. This agrees with Mr. Thompson's experience."—*Dublin Medical Press*, Jan. 23, 1856, p. 51.

It is almost unnecessary to add, that enlargement of the prostate, while it sometimes narrows, and frequently renders tortuous, that part of the urethra which passes through that organ, cannot be regarded as coming within the definition of stricture. That organic narrowing of the urethra only, which commences within its own walls, and not that which is caused by external tumour, being understood to constitute the stricture which, commonly affecting all other parts of the urethral canal, is not found in its prostatic portion.

It may perhaps be considered that an amount of labour has been bestowed upon the acquisition of facts respecting the situation of organic stricture, which is more than commensurate with the importance of the subject. I do not, however, regret the pains bestowed upon the elucidation of a point which bears an important relation to the question of cutting operations in the perineum for the treatment of stricture hereafter to be discussed, and which I may be permitted to say could not be satisfactorily cleared up in the absence of information which could only be derived from a more comprehensive examination of the existing facts than had been previously made.

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* See note also on the preceding page, in which Mr. Walsh of Dublin describes a stricture extending from the membranous to the prostatic portion.

CHAPTER III.

SYMPTOMS AND PATHOLOGICAL EFFECTS OF ORGANIC STRICTURE.

Interval which may elapse between the occurrence of the cause and the first appearance of the stricture—Earliest symptoms observed—Frequent micturition—Pains, local and general—Concomitant affections of the rectum, &c.—Urethral discharge—Retention of urine sometimes the earliest symptom—Sometimes the chief symptom—Tendency to contract—Changes in the urine—Hæmaturia—Incontinence, with distended bladder—Organic changes in the bladder—Chronic urinary abscess—Urinary fistula—Rupture of the urethra—Rupture of the bladder—Constitutional effects of stricture—Attacks of rigors—Fatal effects of slight injuries to the urethra in some cases—Dangers of rapid or extreme dilatation—Neuralgic pains—Classification of strictures according to prominent pathological tendencies.

In commencing the important section of this work, which relates to the SYMPTOMS OF STRICTURE OF THE URETHRA, I shall, in the first place, consider that kind which is most commonly presented to us, is accompanied by the most numerous and varied complications, and offers the widest field for investigation, viz. the ORGANIC AND PERMANENT STRICTURE, both in its simple form, and as complicated with retention or extravasation of urine, abscesses, fistulæ, false passages, &c., &c.

I shall endeavour to give a general outline of the origin and progress of a case of organic stricture, and of the manner in which its complications are commonly observed to arise, so as to present a general epitome of those records on this subject which the annals of surgery most amply supply. A certain number of illustrative cases, almost all of which have come under my own care, and of which, in very many instances, the narratives have been dictated by the patient to myself, are interspersed throughout the work, and allusions will be made to them in passing, so that the symptoms, or, more properly speaking, the complete history, of organic stricture will occupy the present chapter.

EARLY SYMPTOMS.—The chain of occurrences which unites the first lesion of the urethral canal with that degree of contraction which becomes obvious to the patient as a stricture, and for the first time brings him under the notice of the surgeon, is of necessity rarely to be observed. Neither is it possible always to learn what that original lesion was, or when it took place, or whether any distinct cause or commencement was recognised at all. But in the vast majority of cases we shall find it traced by the patient himself to the occurrence of an attack of urethritis at some previous period, between which and his discovery of stricture an interval of time greatly varying in different cases will be found to have existed. Thus in several instances, narrowing of the stream has been observed to take place within a month or six weeks of the commencement of an attack of gonorrhœa; while some patients protest that they have never experienced any change for twenty years after such an attack, at which time, and with no other assignable cause, contraction of the passage is first discovered. In the estimation of all such statements, some allowance must be made for the great indifference and obtuseness to sensations which some individuals exhibit, as compared with the hypersensibility and studious attention to their own feelings met with in others. Thus the agricultural labourers, as a body, are remarkably careless respecting the occurrence of any morbid condition, or the imperfect performance of their animal functions, provided no great measure of pain be present; and they will often suffer a very considerable amount of inconvenience without any anxious speculation as to the cause, or convictions respecting the necessity of obtaining professional assistance. The inhabitants of towns, on the contrary, are much more acutely sensitive to any deviations from their healthy state, and much more prone to entertain serious views of these as well as of most other bodily ailments. Hence it is necessary to bear in mind these facts in order to weigh well the statements which a patient makes, and to obtain from him a history which for the most part shall be strictly true. These remarks will not be deemed out of place when we consider the importance and the difficulty of obtaining correct histories; and those who have had much experience in compiling them from the accounts which are furnished by patients, especially by those who belong to the less educated ranks, will instantly feel their force. Indeed, in no case is it possible to be too particular, more especially at a time when statistical tables and reports command so much attention as at the present, not so much to obtain a *great number* of histories, as to take care that those recorded as such are most certainly faithful; and this they rarely will be, however desirous the investigator may be honestly to relate the simple facts, unless the patients' statements are patiently and vigilantly tested by cross-examination and close inquiry.

The earliest symptom usually noticed by the patient is a little gleety discharge, almost constantly present in greater or less quantity. Some uneasiness is felt, or it may be occasional pricking pain in some part of the course of the urethra, or a little smarting when the urine passes over it in micturition, but varying in intensity. The contents of the bladder are emptied at shorter intervals than has been natural. The stream is somewhat altered in form, not having the full rounded character of health, but more or less flattened; it may be twisted, spirting, forked, or even divided, which conditions are caused by the current of water being insufficient in size and force to dilate and extend the lips of the meatus externus, so that the fissure-like form of that opening modifies the stream; and if its momentum be insufficient to separate each lip from the other, the urine issues above and below, so that two small streams are produced instead of one. At the same time, it must not be concluded that the existence of such a stream is by any means, *per se*, a proof that stricture exists, since many persons, from a tumid condition of the meatus alone, habitually pass such an one. Then gradually, as contraction increases, or as fresh obstacles occur in other parts of the urethra, it grows smaller, and in time the urine may issue only by drops; or, during the passage of a small stream, drops may simultaneously fall directly from the orifice. Meantime, although the force by which it is propelled, viz. the contractile power of the bladder, is augmented, there is little momentum in the current which leaves the meatus, and the urine cannot be projected to any distance. Often the efforts at the commencement of the act of micturition are repeated during several moments, or even for a minute or two, before the urine can be made to issue at all; and after the stream has stopped, and the muscular contractions of the bladder and abdominal muscles have ceased, a few drops trickle away, not felt usually until after the patient's dress has been adjusted, an occurrence which is due to imperfect closure of the canal, owing to the influence which the contractile structures around would otherwise possess over it, being obstructed by the presence of the indurated tissue about the stricture, so that the sides of the canal cannot be brought into close approximation. Hence the little dilatation which to a greater or less extent exists behind it in most cases, contains some fluid not expelled by the ordinary efforts, and this, in consequence, dribbles out by the force of its own gravity when the penis assumes the pendant position. Generally speaking, the act of micturition is always prolonged to an extent corresponding with the degree of obstruction present.

ADVANCED SYMPTOMS.—One of the most distressing symptoms, perhaps, from which the patient suffers is the constant desire to make water, which is almost invariably present in severe cases, giving rise, as it does, to frequent and painful acts of micturition. In this way the sleep is broken, or almost destroyed, some patients being compelled to rise from bed ten or twelve times in the course of the night, while, in the worst cases, or during temporary exacerbations of the complaint, a great portion of the time is spent in laborious and unavailing efforts, by change of posture or by straining, to obtain some relief. These frequent calls to micturate may arise either from diminished capacity in the bladder, through concentric hypertrophy already described, or from increased irritability, which may lead to, or be the result of, existing chronic inflammation of the organ, or from an abnormal condition of the urine itself, presently to be noticed; or, indeed, as is most commonly the case, from all three combined. Coexistent with these conditions there will be a sense of heat, soreness, or smarting experienced about the bladder, especially at its neck, greatly aggravated by an excess of acid in the urine, by cold, or imprudence of any kind telling on the parts. Patients often experience much pain just above and behind the pubes, a symptom frequently accompanying stricture, and which is generally significant of the existence of some degree of chronic inflammation affecting the mucous membrane of the bladder. Sometimes a dull aching pain in the perineum, or in the back and loins, is most complained of. Sometimes severe and darting pains in one or both testicles, extending to the spermatic cord, or into the groins. An aching pain in the glans penis is also frequently experienced. Nocturnal emissions of semen are not uncommon consequences. The general irritation about the urinary organs, extending more or less to the seminal vesicles, occasions by sympathy unnatural contractions of their coats, just as straining and tenesmus also occur, in a similar manner, in the fæcal passages. These emissions *may be* moreover promoted by that dilatation which the ejaculatory and prostatic ducts suffer in common with the whole urethra behind the stricture, from the fluid pressure exerted equally there on all sides in the act of making water. This irritation appears in some cases to be propagated to the testicles, which become painful, and even the subjects of chronic swelling and induration. Pain is often experienced in coition; and if the contraction be considerable, the semen passes backwards, in part or entirely, into the bladder, from which it is discharged afterwards, so that the power of fecundating may be lost from the mechanical obstacle to the act of ejaculation; or the erection may be rendered imperfect by effused lymph into the cells of the corpus spongiosum preventing the free circulation of blood through it. And in some cases a purulent discharge resembling gonorrhœa, but milder in character, is liable to follow sexual intercourse.

The powerful straining of the rectum just alluded to, leads to its necessary consequences about the anal extremity, viz. more or less protrusion of the mucous membrane through the external sphincter, heat, irritation, and finally inflammatory thickening; so that hæmorrhoids and prolapsus of the mucous membrane are by no means unfrequent consequences of a long-continued or tight stricture of the urethra. Some patients rarely attempt to pass water without visiting the water-closet, from their inability to prevent the escape of the contents of the rectum through the efforts required for that purpose. Even herniæ of the intestine have sometimes occurred from the muscular exertions made use of to effect micturition.

There is also, in most cases, an increase of the mucous secretion of the canal; or rather, this is mixed to a greater or less extent with some purulent matter, and has an opaque and slightly yellowish appearance. Not unfrequently it is transparent, or nearly so, and contains numerous fibrous shreds floating in it, which have been compared to particles of vermicelli. This matter oozes from the meatus, and stains the linen, and its presence is a very frequent concomitant of urethral contraction. Indeed, the existence of a long-standing or obstinate "*gleet*," as such chronic discharges are termed, should always arouse inquiry for stricture, and a sound should be passed in order to ascertain the calibre of the canal, if it have not been already done. I have known instances in which this symptom has been so prominent that the patient has been treated for gonorrhœa during a period of many weeks without any suspicion arising that a stricture existed, which was its sole cause; the subsequent recognition of the contraction and its cure having been attended with the complete cessation of the discharge.

Hypertrophy of the penis is not an unusual concomitant, although by no means present in all or even in the majority of cases. It is also often indurated, sometimes deformed, although these conditions may result from inflammation which occurred prior to the existence of stricture. An indurated portion may sometimes be felt externally, in the course of the urethra, corresponding in situation with the seat of the internal obstruction, and feeling like a ring of cartilaginous substance of varying extent.

RETENTION OF URINE.—Sometimes the first indication of the presence of stricture is the occurrence of complete retention of urine. The contraction has previously been insufficient to call the patient's attention to it; but either by exposure to cold, or after some unusual irregularity, or by too free indulgence, either in the use of alcoholic drinks, in sexual intercourse, or in both together, on the attempt to comply with an urgent desire to empty the bladder, which may have become rapidly full from the action of stimulus on the kidneys, the individual is astonished and alarmed to find himself unable to evacuate more than a few drops. This may be, though not very commonly, the first revelation he receives of the fact that a slight stricture exists, which has exposed him to danger from the consequences to it of the excesses indulged in. But although it is necessary thus to allude to such a case here, it will more properly be considered under another head, inasmuch as the phenomena described may occur even without the necessity of assuming the prior existence of any permanent contraction of the canal.

There are a few cases, also, in which the most prominent symptom throughout is retention. There may be but little irritability of bladder, and the stream of urine, when passed, is not necessarily very small; a No. 6 or 7 catheter may pass through the urethra; but a true organic stricture is present, and may perhaps be verified by the touch, as a ring of indurated material in the course of the urethra. The patient is liable to retention on all occasions, and finds no relief but from catheterism; attempts at dilatation are always followed by inability, more or less prolonged, to pass water, until an instrument of very large size has been reached. (Case 7, end of Chapter VI., and Case 15, end of Chapter IX., are examples.)

Closely related to this condition is another, accompanying some forms of the disease, chiefly those of long standing, the prominent symptom of which is a tendency to rapid recontraction of the stricture after dilatation. It may be very amenable to this treatment, instruments of medium or even of full size may be introduced, sometimes in two or three sittings, but after a few days of cessation from treatment, the narrowing is as complete as ever, and a small instrument only can be passed. The symptoms are often severe, and find a very temporary palliative in dilatation. These phenomena seem to arise from elasticity in the materials of the constricting tissue itself, which appears to possess almost the mechanical properties of india-rubber. This stricture in its most confirmed form has been called "the resilient stricture" by Mr. Syme. This character affects especially strictures of the external meatus, and those at the centre of the spongy portion.

CHANGES IN THE URINE.—The urine itself also exhibits a tendency to change, which becomes more marked in proportion as the case advances without relief being afforded. Owing to the retention of a portion of urine in the bladder, from a deficiency of power on the part of the organ to empty itself, partial decomposition of the secretion follows,* which in consequence irritates the mucous membrane with which it is in contact; and thus urine, cloudy, emitting a pungent ammoniacal odour, and depositing, as it cools, a quantity of pus and mucus, the products of inflammation of the bladder, is not an unfrequent accompaniment of stricture. This is the origin of the slimy tenacious deposit found adhering to the bottom and sides of the vessel containing it, and which is exceedingly characteristic and well known. Such urine is usually alkaline to test paper, in which case it generally deposits also a dense pale precipitate, which the microscope shows to be composed chiefly of the prismatic crystals of the triple phosphate of ammonia and magnesia, of exudation or compound granular corpuscles, epithelium, and some pus (see Plates III. and IV., Appendix); while on its surface an iridescent film or pellicle collects, commonly found to consist of the triple phosphate, and sometimes of the phosphate of lime. Urine, however, is not invariably alkaline when mucus is present, although the latter secretion being naturally so, may, if in sufficient quantity, communicate to slightly acid urine a degree of alkalinity. It is not uncommon to observe in chronic cases that the mucus discharged is streaked with opaque white striæ of phosphate of lime also. In these circumstances the conditions favourable to the formation of calculus being present, we accordingly sometimes find the co-existence of a phosphatic formation in the bladder, with a long-standing obstruction in the urethra. In other cases, where the chemical decomposition described does not take place, at all events to any great extent, the urine, not being ammoniacal, nor even alkaline, may yet be sometimes extremely fœtid, from, as it appears to me, the evolution of sulphuretted hydrogen, through decomposition of organic matters, such as epithelium, thrown off from the urinary passages, and mingled with the urine. While considering the subject of urine, I may allude to hæmaturia as one of the occasional concomitants of stricture. Blood sometimes comes from the bladder, in small quantity, in the chronic inflammation of that organ just described, communicating a dark tint to the urine. It very frequently follows the use of the catheter, but it may also appear when no instrumental interference has taken place. This is probably due to the rupture of some vessels during erection of the penis, the urethra being unduly confined by the presence of the stricture, and strained by the act. Thus painful erections are apt to occur, something like to chordee. Perhaps it may also occasionally issue from ulcerated surfaces behind the stricture. The blood passed in these cases is less intimately mingled with the urine than when it is poured out from the bladder; or it may appear by itself, and not during the act of micturition; or it may only form a clot in the urethra, and be expelled as such during that process.

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* The process by which carbonate of ammonia appears in the urine and renders it not only alkaline but extremely irritating, is thus explained. The urinary principle Urea (C_2 H_4 N_2 O_2), a somewhat complex organic salt, contains the elements of carbonate of ammonia, minus water (HO). It is prone to decompose, acquire this water, and so produce the latter salt. Thus:—UREA, $C_2\ H_4\ N_2\ O_2 + 2\ HO = 2\ NH_3\ CO_2$ or CARBONATE OF AMMONIA. This occurring in contact with sensitive tissues within the bladder, soon irritates and inflames them. It is not that the urine is secreted alkaline; on the contrary, acid; but on arriving in the bladder it mixes with other urine, in which the change has already commenced, and containing much of the mucous secretion from the bladder itself, the presence of which appears to determine the occurrence of the decomposition by a kind of catalytic agency in a more rapid manner than it would otherwise take place.

RETENTION AND ENGORGEMENT.—As the case advances, attacks of complete retention, depending on causes above-mentioned, become more frequent; each attack, from a variety of causes, leaving the stricture narrower than before. The urine is at length habitually discharged by drops, so that a stream cannot be said to exist. Sometimes the urine passes away involuntarily during the unconsciousness of sleep; and at length the patient loses the power to retain it altogether. At this stage "incontinence" is often said to occur, which term does not here apply either to an irritable or to a paralysed condition of the bladder, incapacitating it to retain its contents, although it has frequently been mistaken for this. The urine constantly dribbling off renders the poor victim's condition obvious to all with whom he comes into contact; a urinous odour infects him, and, despite all his precautions, the secretion escapes through all the bandages and contrivances applied to absorb and retain it, excoriates his skin, stains his clothes, and renders him offensive to himself and others. By day and night he has to bear up against the evil, and is ever labouring to avert its noisome and disgusting consequences; often tormented as much by the effects he fears his unhappy state must have on the minds of his nearest friends and attendants, and by the consciousness of having become a source of annoyance to them, as by the bodily sufferings which he experiences from the disease itself.

But these symptoms, in nine cases out of ten, indicate that the bladder is distended, and that the *surplus only* runs off in the manner described, while the organ is constantly filled with the staler and more noxious portions of the urine, unless it be frequently emptied by the catheter. Thus it is a state of retention also, or rather of engorgement, and not of incontinence. The extent of dulness on percussion over the pubes will indicate not only that this condition exists, but what is the size of the tumour formed by the distended viscus. Under these circumstances, disease of the bladder is increased, and disorganization more readily induced than before. Thus ulceration of its mucous membrane may occur, and the like takes place in the dilated part of the stricture behind the urethra.

CHRONIC ABSCESS AND FISTULÆ.—As a result of inflammatory action in the tissues bordering upon the affected part of the urethra, suppuration frequently occurs, and abscesses result, already described in the chapter on the pathological anatomy of stricture.

A circumscribed tumour, not generally productive of much inconvenience at first, though occasionally giving rise to fits of shivering, appears in some part of the perineum, and after a long and tedious increase in size becomes very painful, reddens, and bursts by a small opening; matter is discharged, and the urine follows sooner or later, in greater or less quantity, and thus a urinary fistula is constituted, which affords partial relief for a time to some of the inconveniences of the stricture. Additional fistulæ may succeed, and the whole scrotum and perineum become drilled with openings; such passages may also form on the thighs, nates, or in the muscles of the pelvis. Meantime all the tissues around become swelled, thickened, and rendered dense and hard by the interstitial deposit thrown out in the long-continued inflammatory process, and now the urine passes in considerable quantity, and sometimes altogether, through the unnatural channels which exist. But in some cases the small swelling at first observed seems to remain stationary, or it may even subside without breaking, and reappear or not at a future time. This depends usually on treatment; the first steps in its formation take place, but the cause, *i. e.* the stricture, being removed by proper attention, in course of time the effect disappears.

Such are the usual symptoms and course of chronic urinary abscess, strictly so called. Still there is good reason to believe that many perineal abscesses are occasioned by irritation and inflammation in the neighbouring parts, having no direct communication with the urethra, at all events at the outset of their progress; a state of things which is constantly observed to happen in the ischio-rectal fossa, where abscess results from rectal irritation, but in which there is no communication with the bowel at the outset. Indeed it often happens, as already intimated, that when a collection is opened in the perineum pus only issues; after a few days a drop or two of urine may appear, and then urinary fistula is established. Such a case undoubtedly belongs to the latter class, the opening between the urethra and the abscess having occurred subsequently to the evacuation of the latter. And it may be further supposed, with some degree of probability, that the urethral communication, even when found to exist at the time of the opening of the abscess, may have been effected by that progressive action of its contents upon the surrounding tissues, which is commonly designated by the term "ulcerative absorption."

Rupture of the Urethra.—But we may have a more active and most dangerous state set up under different circumstances, by a somewhat similar lesion of the canal to that just described. Thus during one of those fits of retention already noticed as frequently supervening on permanent stricture, while the patient is vainly tasking his strength to the utmost to void his urine, not voluntarily, it may be remarked, for the painful and laborious efforts at straining, in which the whole system appears to participate, are then to a great extent reflex and involuntary, of which the distended bladder is the exciting cause, sudden relief is afforded. The patient instantly feels the indescribably painful sense of distension greatly mitigated. He is, however, conscious that something has given way, while still no water flows by the urethra. Bodily exhaustion, and satisfaction at even momentary respite from the agonies he has endured, perhaps combine to induce rest and sleep. But a short time suffices to render obvious enough the catastrophe that has taken place. The urethra has given way behind the stricture, either from rupture of its previously thinned or ulcerated walls, or by the bursting of the parietes of an abscess in connection with it, in consequence of the enormous hydrostatic pressure exerted upon it, and the same force has driven through the wound the noxious contents of the bladder, which, now penetrating rapidly the cellular structure in every direction, where it is not limited by fascial partitions, distend the scrotum and penis enormously, breaking up the cellular connections, giving rise at first to active inflammation with all its attendant symptoms, and rendering the death of large portions of integument and subjacent tissue almost inevitable. At the same time severe rigors occur; great depression of the powers of life follows, and if the distended parts are not relieved by free incisions, the fluid rises above the abdomen, and may even reach the thorax, from the continuity of the cellular tissue in which it is effused. It has been already shown that it cannot descend into the thighs in these cases, from the connections of the fascia in the groins with Poupart's ligament. At first, livid discolorations, and then dark gangrenous spots appear, accompanied by increased symptoms of constitutional sinking. The pulse is small, feeble, and often intermittent; the surface covered with cold perspiration; the patient becómes delirious, then comatose, and death closes the scene. (See Case No. 23.) At the same time the recovery from far advanced extravasation appears sometimes marvellous, provided that the means of exit afforded to the urine, when supplied, are really ample, and that the powers of nature are well supported subsequently. (See close of Chapter X. and Illustrative Cases appended.)

RUPTURE OF THE BLADDER.—But the occurrence of another and still more frightful consequence is possible, as a result of unrelieved distended bladder. The viscus itself may ulcerate and give way, and its contents be poured out in the cellular tissue of the pelvis, and that which lies beneath the peritoneum, or into the peritoneal cavity itself. True, this is happily a very rare event; still it has occurred, and it need not be added that the severest form of peritonitis follows, and rapidly proves fatal. Its rarity of occurrence may be further deduced from the fact that there is only one specimen of ruptured bladder *from retention of urine* in the Museum of the College of Surgeons, and that not caused by stricture. It took place in a woman.* (See also Cases Nos. 24 and 25.)

CONSTITUTIONAL EFFECTS.—Thus far our attention has been chiefly directed to the *local* symptoms of stricture. Nothing can be more obvious to the practical surgeon than the extensive sympathies which exist between the genital organs and the constitution at large, and consequently this affection, if long continued, is rarely unaccompanied by general as well as local indications of its presence.

Thus, there is usually more or less disorder of the digestive organs, with its various concomitant symptoms, followed in time by the consequences of impaired nutritive function. The patient becomes wan, loses flesh and strength, looks anxious and careworn, depressed and listless, or extremely irritable, complains of pains in the back and loins; is sometimes subject to attacks of shivering, followed by perspirations, and bearing some resemblance to intermittent fever, but evidently having specific characters of their own.

URETHRAL FEVER.—There are some patients, the subjects of stricture, who invariably experience rigors after the passage of a bougie, or if an instrument but one number larger than the accustomed size be passed; in some even without any apparent exciting cause, more especially in those who have inhabited warm climates for any length of time, these attacks are prone to occur.

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* Preparations illustrative of ruptured bladder from stricture may be seen in Guy's Hospital Museum, No. 2090; St. George's Hospital Museum, S. 21.

The application of an irritant or corrosive substance to the urethra is also not uncommonly followed by some general fever. So well known and characteristic is this phenomenon, that it has received the special name, and not inappropriately, of "urethral intermittent fever." It may occur in the absence of stricture from various kinds of irritation to the canal.* In many instances it occurs only after the first act of micturition following the application of the irritant, as if from contact of urine with the abraded urethra, or with the wound, if incisions have been made.

I have, however, frequently noticed that when evidence of organic renal disease exists, the symptoms described are almost certain to occur; so much so, that we are justified in suspecting its presence to some extent when severe rigors constantly follow slight urethral irritation in patients not predisposed, by climate or otherwise, to experience them, and who have suffered for some time from stricture. I have observed on more than one occasion, suppression of urine rapidly followed by death, to result from the introduction of an instrument larger than the patient has been accustomed to, in the hands of a surgeon who from some accidental cause has replaced the ordinary attendant, and who has unwittingly endeavoured to carry dilatation beyond the usual limit; or again, when the ordinary instrument has been less skilfully employed, and an abrasion, although only an exceedingly slight one, has been made in the mucous membrane of the urethra. The rapidity with which death may occur, under these circumstances, in patients who are the subjects of extensive chronic disease of the kidneys, from an apparently exceedingly trifling lesion so caused, appears almost unaccountable. The fatal event seems to occur through poisoning of the system by urea; the post-mortem appearances, to the naked eye, do not resolve the problem in the cases referred to, by exhibiting traces of acute disease resulting from the particular lesion. It may be imagined that the function which determines the elimination of urea suddenly and absolutely ceases after a very slight injury to the urethra, as by the propagation of some shock to the excreting organ, in cases where its structure is largely disorganized. I have even seen one case of old standing and narrow stricture, in which death was thus caused within fifty-four hours of the passing of an instrument, the same that had been habitually employed on at least a hundred occasions before; no damage whatever having been inflicted by it upon the urethra, as verified by several careful observers on close post-mortem examination of the parts. Rigors and vomiting commenced about an hour after the catheterism, and not another ounce of urine was secreted from that time until death. In this case the kidneys were found to be congested to an extraordinary degree, and their substance was so soft and friable as to give way under gentle pressure. Very rapid changes had evidently taken place in these organs, but no signs whatever of inflammation existed in any other part of the urinary apparatus. So also a catastrophe, equally but not quite so rapidly fatal, may happen from another affection, viz. purulent infection of the blood, with deposits in the joints or other parts, and which is unquestionably an occasional result of injury to the urethra inflicted by rapid or extreme dilatation. This subject will be hereafter considered more fully under the head of treatment.

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* M. Chassaignac has made the observation, that the "urethral intermittent" occurs from some irritating contact with *the bulbous and anterior part* of the urethra, not with the prostatic and membranous portions; remarking that thus it never occurs in women, whatever the amount of instrumental application.—*Mon. des Hop.*, 1857. No. 135.

Pains, apparently unconnected in any way with the seat of the disorder, are occasionally found to be co-existent with stricture; thus, pain in the sole of the foot long complained of may be referred sometimes to this cause, and has even led to the discovery of the urethral lesion. Neuralgic affections of the thighs, and of other parts of the body, sometimes appear to have a similar connection with it. I have known such to be treated for a long period without success, until the calibre of the urethra being restored, they have simultaneously disappeared.

Further, it will be unnecessary to do more than state, without entering into details, that the local and general signs of inflammation of the bladder, or of other portions of the urinary apparatus, may be presented in those cases in which such conditions have supervened on organic stricture, and which are sometimes found arising from it. As regards diseases of the prostate, depending on stricture, chronic inflammatory enlargement, with abscess, may be thus caused. It is almost superfluous to add that the hypertrophy of the organ met with in elderly people is wholly independent of and unconnected with it.

Pathological Classification of Stricture.—From a review of the symptoms which mark the existence of organic stricture, I think we may constitute three classes, which will embrace all the varieties of the disease, and so serve as a means of describing in brief terms any particular example. It is founded, not on anatomical characters, which can only be altogether appreciable to the morbid anatomist (*vide* Chapter II., page 57), but on pathological phenomena, and so is available for useful purposes during life. Already mentioned in the preceding chapter, it has found its exposition in the present one, and may be appropriately placed here.

CLASSIFICATION OF ORGANIC STRICTURES, ACCORDING TO THEIR PROMINENT PATHOLOGICAL TENDENCIES.

I.—SIMPLE STRICTURE :—

Its chief sign is diminution in the size of the stream ; there is increased frequency of micturition also, although the amount varies greatly in different cases.

II.—SENSITIVE OR IRRITABLE STRICTURE :—

Proneness to disturbance of the nervous system, as evidenced by chilliness, irregular circulation, or even rigors on very slight irritation. Great pain is caused even by the gentle application of instruments, and it continues sometimes long afterwards. In a few cases, also, a disposition to hæmorrhage is manifested.

III.—CONTRACTILE OR RECURRING STRICTURE (resilient of Syme) :—

There is constant tendency to become narrower in the absence of treatment ; and contraction rapidly recurs after dilatation has been applied.

CHAPTER IV.

CAUSES OF ORGANIC AND PERMANENT STRICTURE.

John Hunter's views of the causes of stricture—Sir A. Cooper, Sir E. Home, Abernethy, Charles Bell, Brodie, Lawrence, Liston, Chelius, Ducamp, Civiale, Leroy D'Etiolles, on the subject of causes—An analysis of 220 cases—Causes of organic stricture enumerated—I. Inflammation—The gonorrhœal—Different opinions discussed—Relation of urethritis to subsequent stricture—History commonly presented—Localities affected by gonorrhœa and stricture said to be different—Inflammation arising from non-specific causes—Spasmodic contractions of the urethra—Secretions from the female passages—Abnormal conditions of the urine—Effect of alkaline and of acid urine—Excess of venery; injections; caustics—Horse exercise, masturbation, &c.—Constitutional or idiopathic tendencies—The tuberculous diathesis—Congenital irritability of the urinary organs—Gout and rheumatism—Influence of climate—Use of fermented liquors—II. Cicatrisations and adhesions—Cicatrices after chancres—Following abscess—And wounds of the urethra—Lacerations of the urethra—Caused by horse exercise—By chordee—By the use of instruments—Incisions of the urethra—Amputation of the penis—III. Growths—IV. Congenital impediments—Malformation—Occlusion—Analysis of cases.

We now come to the causes of permanent or organic stricture; a subject which, perhaps, has not received all the attention it deserves, more especially as the opinions which have been expressed respecting it by different observers of great eminence are somewhat dissimilar.

It will be the object of this chapter to endeavour to elucidate the subject more fully, and to explain these discrepancies: first, by quoting the views of authorities of note; and secondly, by adducing the result of my own labours, undertaken with an especial view to a solution of the question proposed.

John Hunter "doubts very much if stricture commonly or ever arises from the effects of the venereal disease, or to the method of cure." He further says, "Strictures are common to most passages in the human body; they are often to be found in the œsophagus, in the intestines, especially the rectum, in the anus, in the prepuce, producing phymosis; in the lacrymal duct, producing the disease called fistula lacrymalis, where no disease had previously existed. They sometimes happen in the urethra where no venereal complaint had ever been. I have seen an instance of this kind in a young man of nineteen, who had had the complaint for eight years, and which, therefore, began when he was only eleven years of age. It was treated first as stone or gravel. He was of a scrophulous habit, the lips thick, the eyes sore, a thickened cornea of one eye, and the general habit weak. This stricture was in the usual place, about the membranous part of the urethra." *

This passage is given entire, because the case quoted illustrates one of the causes hereafter to be noted, although not named as such by John Hunter himself. (Page 116.)

The great pathologist, however, stands almost alone in this opinion.

Thus, Sir A. Cooper says,—"As to the manner in which stricture is produced, I am opposed on this point to Mr. Hunter, one of the greatest surgical authorities that ever lived; and, if asked what was the cause of stricture, I should say, in ninety-nine cases out of every hundred, it was the result of gonorrhœa . . . . . . or of any excess when the patient is labouring under that complaint." †

Sir E. Home says,—"There are so many instances where the symptoms of stricture have been immediately preceded by a severe gonorrhœa, from the effect of which the membrane had never recovered, that there has long been little doubt in my own mind of gonorrhœa being a very general cause of strictures." ‡

Mr. Abernethy believes,—"That gonorrhœas are very liable, if they be improperly treated, to lay the foundation for stricture." §

Sir Charles Bell.—"The most common cause of stricture is gonorrhœa; still the specific inflammation is not always the occasion of it. . . . . . So constantly is inflammation the forerunner of stricture, that it may be held a point as well established by evidence, that the origin of all strictures in the urethra is in consequence of inflammation, as that adhesions of the pleura are produced by it." ‖

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* "Hunter on the Venereal Disease," 2nd Edit., pp. 166-7.

† Surgical Lectures reported in the "Lancet," vol. iii.-iv. p. 222.

‡ "Practical Observations on Treatment of Strictures," &c., 3rd Edit. vol. i. pp. 33-4.

§ Surgical Lectures, reported in the "Lancet," vol. vi. p. 323.

‖ "Treatise on Diseases of the Urethra," &c., 3rd Edition, Shaw, pp. 106-7, 1822.

Sir B. Brodie.—"It may sometimes be traced as the consequence of a severe and long-continued attack of gonorrhœa." *

Mr. Lawrence says,—"That stricture is produced by a change of structure in some part of the canal, consequent upon effusion produced by inflammation, or on the cicatrization of an ulcerated surface. . . . . . . And undoubtedly the most frequent cause is gonorrhœal inflammation." †

Mr. Liston.—"Stricture of the urethra arises most frequently from specific inflammation, or gonorrhœa of long standing, probably neglected, or ill-treated and aggravated during the first stage by acrid stimulating injections and free living." ‡

Chelius.—"Stricture is frequently observed after gonorrhœa, especially if that have been long continued and improperly treated. The causal relations, however, which the stricture has to a previous clap, are often unknown, as it is observed after both severe and slight clap, whether treated with or without injections." §

Ducamp says,—"If we carefully question a patient, we shall find that he has had one attack of gonorrhœa, or more, but that the attack occurring last before the appearance of the stricture was very chronic." ||

Civiale discusses the subject of "Urethritis" as a cause, at some length, and states it to be his opinion, that "it ought to be placed in the first rank in the list of causes." In summing up his remarks on this head, he observes as follows:—"In taking great care in the examination of a patient, we almost always discover at last, that more or less urethral discharge has existed for some time, sufficient to stain the linen."

He then asserts that this affection *may* never have been acute, but chronic at its commencement, and not necessarily following impure, or even, indeed, any sexual connection. He enumerates other causes as of far less influence, but of which the agency is undoubted. These are, "abuse of instruments employed in affections of the urethra," "violence applied to the perineum," "arrest of calculi in

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* "Lectures on Diseases of the Urinary Organs," 4th Edition, p. 2.

† Lectures reported in the "Lancet" (No. 76 Lecture), Aug. 14, 1830.

‡ "Practical Surgery," 4th Edition, p. 467.

§ "Chelius," translated by South, vol. ii. p. 355.

|| "Ducamp's Traité des Rétentions d'Urine," &c. Paris, 1822.

the urethra," "perineal section," and "abuse of coitus and prolonged erections."*

Leroy D'Etiolles says,—"All that produces inflammation at the extremity of the urethra is a cause of stricture. Gonorrhœa is to be placed in the first rank. . . . Old and obstinate discharges in particular, which in time produce ulcerations, leave the germs of stricture after them. To prevent these ulcerations by stopping the discharge at the outset, is, in appearance at least, to act in a rational manner. Astringent injections appear then to be rather a preventive than a cause of strictures." But on the following page, he recognises "injections which are too irritant," as producing strictures and other disorders.†

It will be observed, that all the foregoing extracts are statements of opinions founded upon the general experience of the writers, but not established by researches specially directed to that end, such as by any comprehensive analysis of a large number of cases, with a view to a statement of the respective influence possessed in the production of stricture by its various causes, as indicated by their proportionate numerical relations. To the attainment of the latter object my own attention has been especially directed. For this purpose I have carefully collected and arranged 220 cases, of which 143 are those of ***hospital in-patients***, admitted for the cure of stricture, or of its effects, retention of urine and the like, taken from the unpublished records in the case books of University College Hospital, many of which have come immediately beneath my own care and observation, and the particulars of which possess the highest degree of authenticity. A second portion, forty-nine in number, is formed by the most carefully-written reports which have appeared in the journals containing the required particulars, almost all of which are hospital cases also. It will therefore be at once seen, that these 192 examples of stricture are not specimens of the average, but of the worst forms of the disease, inasmuch as the milder forms rarely find their way within the walls of such institutions, but are treated as out-patients. To estimate them aright, they should be regarded as, for the most part, illustrative of the disease when aggravated by the

* "Traité pratique sur les Maladies des Organes Genito-urinaires." Paris, 1837. Tom. i. pp. 152–157.

† "Des Angusties ou Rétrécissements de l'Urètre," &c. Paris, 1845, pp. 67–9.

consequences of neglect, debauchery, or privation, to an extent rarely indeed met with among the middle classes, unless in connection with those who, from the demands of professional duty, are denied the benefit of surgical treatment, or are compelled to follow engagements incompatible with its successful prosecution. Thus we meet with some of the worst instances of the affection in officers of the naval and military services. Certain it is, that if treated judiciously, and soon after its first appearance, few diseases are so manageable or so amenable to treatment, and in none, perhaps, is the difference between the results of neglect and of judicious professional attention, so obvious or so momentous in their consequences to the patient.

The remaining twenty-eight cases are different in their character, and are for this reason appended; some of them being examples of causes, almost peculiar to that class of patients in which they are found, viz. in the middle and upper ranks of society. All of these have come beneath my own immediate notice, directly or indirectly. So that making due allowance for an increased proportion of the milder examples of the hospital form, which never become sufficiently urgent to constitute them inmates of the wards, we shall, by analysis of the table given in the Appendix, be enabled to arrive at an accurate estimate of the characters of the disease in relation to its severity and consequences, and of the nature of its exciting and predisposing causes.

The facts which I have obtained in these cases are as follow:—The patient's age.—Number and dates of any gonorrhœal attacks or other lesions. If the former, whether the discharge continued for a long period of time, or otherwise (in as many cases as this information was obtainable).—Date of first discovery of stricture.—Brief detail of subsequent symptoms, and present condition. These points are noted in five columns, so that a short but comprehensive history of each case is presented to the eye, and the main facts may be comprehended at a glance. (See table at the end of Appendix.) This table is analysed, and the entire results brought into one page at the close of the ensuing section, which is devoted to the causes of organic and permanent stricture.

From a consideration of these cases, I shall offer an arrangement of the CAUSES OF ORGANIC STRICTURE, under FOUR HEADS, and present them with their subdivisions in a tabular form before proceeding to notice each in detail.

CAUSES OF PERMANENT AND ORGANIC STRICTURE.

I.—INFLAMMATION OF THE URETHRA and surrounding tissues.
  1. *Specific or gonorrhœal*, acute and chronic.
  2. *Inflammation arising from non-specific causes.*
    LOCAL NON-SPECIFIC CAUSES:—
    α Repeated spasmodic contractions.
    β Secretions from the female passages, not specific, as the menstrual fluid, &c.
    γ Abnormal conditions of the urine, and adventitious matters contained in it.
    δ Excess of venery.
    ε Injections (?); caustics. Horse exercise.
    ζ Masturbation.
    CONSTITUTIONAL OR IDIOPATHIC CAUSES:—
  Inflammation, simply catarrhal, or depending upon scrofula, gout, and rheumatism.

II.—CICATRIZATIONS AND ADHESIONS, following—
  1. Chancres in the urethra.
  2. Simple ulcers, and the openings of abscesses and fistulæ.
  3. Wounds caused by blows on the perineum, punctures; lacerations from horse exercise. Chordee. Abuse of instruments, blunt and cutting. Passage of calculi. Use of lithotrites. Division of the urethra from the perineum. Amputation of the penis. Lithotomy (?).

III.—GROWTHS IN THE URETHRA.
  Florid granulations.
  Polypoid formations.
  Tubercular and malignant deposits.

IV.—CONGENITAL MALFORMATIONS.

As seen above, inflammatory action in the urethra is most unhesitatingly placed, first and foremost, among the causes of organic stricture, whatever be its source or origin. There is no fact which may be conceived to be better established than this.

1. THE SPECIFIC OR GONORRHŒAL INFLAMMATION.

The relation which an inflammation of the urethra bears to a subsequent organic stricture, is much the same, whatever be the exciting cause of the attack. I shall accordingly endeavour to trace their connection in this place, intending the remarks to possess a general application, and to be borne in mind equally in the consideration of the various classes which will follow hereafter.

The connecting links of that relation are not always very obvious or easy to be traced. Hence their existence has been denied by some writers, and among them Hunter's name has generally been classed. A modern author has also recently enunciated a similar opinion.*

Not admitting "the venereal" disease as a cause, Hunter appears to have accounted for the existence of stricture by supposing a tendency to its production to be inherent in canals generally, stating that "*stricture is common to most passages in the human body . . . . where no disease had previously existed,*"* and citing stricture of the œsophagus, intestines, lacrymal ducts, &c., as examples. Modern pathology, however, will not bear out the correctness of this assertion, nor accept of it, or of any supposed disposition to contract, as sufficient to account for strictures, either of the œsophagus or of the intestine. Besides, the analogy which is assumed to hold good between them is specious and deceptive. A classification of "all the passages of the body" in one category, that is to say, the mere fact of their being "passages," by no means proves that they are alike susceptible of the same morbid influences, or are liable to present the same morbid conditions. They greatly vary, both in structure, in function, and in relation to surrounding circumstances. Take the intestine as an example, the function of which is displayed by continuous contractions of its muscular parietes, in order to facilitate the passage of their contents. Paralyse that action, and obstruction is produced. Is not the very reverse of this the rule in stricture of the urethra, whatever be its cause? Relaxation of the muscular fibres, as we have before seen, is the necessary condition to a free transit through it, and the action of its muscles closes the passage. True, in both cases, obstruction *may* be caused by undue contraction of the muscles, although the phenomenon is probably excessively rare as regards the intestinal tube. It is certainly sometimes narrowed by the cicatrization of ulcers following inflammation, as in dysentery, and after typhoid fever, &c.; so shall we hereafter see is the urethra. It is narrowed often by growths into its cavity, which are most frequently malignant in their character. This is also true of the urethra, in which, however, they are much more rare.

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* "Pathological and Practical Observations on Strictures," &c. &c. By Francis Rynd, A.M., F.R.C.S. London, 1849. P. 6, *et seq.*

Perhaps, the general application of the term STRICTURE to affections which are so greatly unlike each other in their nature, may have given rise to attempts to generalize respecting them, and to seek analogies respecting them which do not exist. What similarity, for example, is there between that narrowing of the urethral passage which results from the contraction of inflammatory products around it, and the occlusion of the œsophagus or rectum by cancerous growths? Yet both affections are

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† "Hunter on the Venereal Disease," p. 167. Quoted at length, p. 101.

conventionally known as stricture. It has been remarked, by some writer, that all canals possess a certain natural inherent liability to become contracted at some point near to their orifices. But this fact arises simply from these being necessarily the portions most exposed to injury, whether from external violence, or in the exercise of an expulsive function, and consequently strictures so resulting are in this sense only, common to the orifices in all. Thus in the urinary passages we find the ureters, comparatively speaking, very rarely narrowed, while the urethra most frequently becomes so, as being infinitely more obnoxious to attacks of inflammation, as well as to the receipt of blows and lacerations. So in the alimentary passages, the pharynx and œsophagus incur the dangers of exposure and become strictured from the effect of contact with corrosive substances. At the anal extremity, violent strainings, whether voluntary or reflex, sometimes required in the act of defæcation, especially in constipated habits, which efforts being produced by powerful voluntary muscles there, not existing in any other part of the track, give rise to lesions peculiar to the neighbourhood of that orifice; while many causes of chronic inflammation act on either extremity of the canal from their amenability by situation to external agencies, which have no influence whatever over internal parts.

Space will not permit the bearings of this question to be discussed to anything like their full extent. Sufficient, however, has been adduced to suggest other points of contrast, and at all events to show that the analogy between the urethra and other passages of the human body is by no means so great as to permit us to infer, more especially in opposition to experience, any proposition respecting the one, deduced exclusively from observation of phenomena which the others exhibit. Let it be once more only asked, how often do we meet with an acute attack of inflammation affecting some particular portion of the œsophagus, or of the intestines, giving rise to exudation into surrounding tissues, to suppurative discharge, and followed by more or less persistence of it in the chronic form? Nevertheless, such an affection is one to which, as we have seen, the urethra is constantly and commonly exposed; the notoriety of its frequency of occurrence here being only equalled by that of its rarity in the former cases. With such want of analogy in the respective diseases of the passages in question, how can we expect to discover a similarity in the pathological conditions which belong to them? With reference to the lacrymal duct, to which Hunter refers, it is worthy of remark that the catarrhal inflammation to which it is subject is the cause of stricture in it, and even of complete obliteration of the passage.

But I am inclined to think that Hunter has been partly misunderstood and misrepresented in this matter. While it must be confessed he does not recognise "gonorrhœa" as a cause, he appears to direct his application of the term mainly to its supposed *specific* character, for he says, page 160 of the work before quoted, "If any of these diseases," meaning chiefly strictures, "arise from a gonorrhœa, they are most probably not the consequences of any specific quality in the venereal poison, but are such as might be produced by any common inflammation in those parts, as was observed of the continued symptoms."

Let us now endeavour to discover what amount of connection may be traced between urethral inflammation and organic stricture.

A man has an attack of gonorrhœa; if the treatment be tolerably judicious, above all, if he be careful and temperate, even for a short time after all signs of the disorder have disappeared, no evil results are generally to be apprehended. A second and a third may be acquired afterwards, which, with similar care, will probably pass off, and leave the patient unscathed, unless certain marked tendencies in the system exist which dispose to chronic inflammation; diatheses, which, as we shall hereafter see, exert some important influence in the matter. But does such a history as this form the type of those we generally obtain from patients suffering from stricture? Assuredly not. Examine the results of the table. In 164 cases of stricture following gonorrhœa, the disease is reported, in no less than ninety, to have been very chronic, or that some discharge remained long after the urgent symptoms had subsided; and this, in a list of reports in which it could not be the object of the writers to make out a case for these or any other views. Among all the remaining instances, it is stated in only six that the patients were "soon cured" of the inflammatory attack. In those reports where nothing is said respecting chronicity, it is simply because the question was not asked, and the fact is unknown; the contrary, therefore, is not to be inferred.

It will be found that a patient's history, in a great proportion of cases, runs very nearly thus. He suffered from a clap some years ago, which may or may not have been soundly cured. After a time another attack occurred; perhaps a third. The last probably received the least attention of the three, the pain being less severe, and the discharge not so profuse as in the preceding attacks; and although it did not subside altogether for a long while, it ceased to be considerable in quantity at an earlier stage of the complaint than it had done before; indeed he will not be positive that he has ever been quite without some little oozing from the urethra ever since, which he has observed chiefly when rising in the morning. He has also noticed that it is increased in quantity after sexual intercourse, especially if it have been somewhat immoderately indulged, and then subsides in a day or two. After a dinner party, perhaps, or any occasion on which alcoholic stimulants have been freely taken, the same thing has occurred. But during a long time he ceased to look for the appearance; for, being insufficient to constitute an inconvenience, he really thought nothing of it. He has been conscious at times also, of a little itching sensation, apparently far back along the urethral passage; it may be, occasionally, some heat, and slight smarting there.

Thus a period of three or four years elapses, and if the patient be attentive to the mode in which his functions are performed he will perhaps first observe, some day, that the stream of urine has a tendency to flow in an odd, screwing, spirting way he never noticed before, and perhaps is smaller in size than he thinks it ought to be. His attention is now aroused to the matter, and in time he discovers further evidence of the existence of a certain amount of urethral contraction. Sometimes, as has been already seen in considering the subject of symptoms, especially if the patient be a person indifferent and careless in his habits, an attack of retention is the first means by which he discovers the existence of stricture, after which the ordinary symptoms become invariably more urgent.

But in many instances the interval of time between the inflammation and the appearance of the symptoms has been exceedingly small, apparently only two, four, or eight weeks. In such it may be assumed that no interval has really existed, for it must be obvious that the first and slightest degree of urethral contraction can scarcely be regarded as appreciable by the patient. Then, on the other hand, we have several examples in which twenty or even thirty years have elapsed, of the authenticity of some of which we have no right to doubt, although perhaps with reference to others it should be remarked that men in years often manifest strong indisposition to confess the repetition of those indiscretions which young men are frequently weak enough to be vain of. The fact of the patient being married also, when it occurs, may be another motive for his declining to acquaint the examiner with the latest occurrences of his history relative to illicit connection, and in this manner some of these professedly long intervals may be accounted for. These remarks are intended to apply to hospital patients in particular. In private practice a fuller confidence exists between the patient and his medical attendant. Still, it is quite unquestionable that instances do occur, although not very frequently, in which organic stricture first appears at a late period of life, no urethritis or spasmodic affection having been experienced for twenty or thirty years before. Does any relation exist in the way of cause and effect in such cases?

There can be little doubt, I believe, that, after numerous attacks of acute urethritis, or of one only, long existing afterwards in the chronic form, a predisposition to congestion and some degree of inflammation exist, just as after an attack of bronchitis or pharyngitis the mucous membrane of the bronchi and the pharynx respectively, are much more liable to similar affections than before. Slighter causes than the original excitant of the first attack are now sufficient to give rise to some condition of the membrane, which may present a modified form of the primary affection, and may be subacute in its characters. Anything which renders the urine irritating, or some other source of local irritation; or external cold producing internal congestion; these causes acting from time to time, form a chain of sequences which will keep alive for years a condition in which the occurrence of an exciting cause, which would be harmless when acting on a healthy urethra, will, in the case supposed, give rise to exudation of plastic matter into the tissues about the tube, afterwards gradually producing contraction, or to an abrasion of the mucous membrane, which, from the constant passage of urine over it, will at length result in an ulcerated surface, indisposed for a long period to heal, but whenever it does so, being followed by cicatrization and subsequent narrowing of the urethra; or this latter, instead of healing, may throw out some exuberant granulations into the canal; or, having extended superficially only, may at last end by adhesion of opposite surfaces. A free habitual use of stimulants, especially of malt liquors, is certainly favourable to the long continuance of subacute inflammation here. Elderly patients also, who possess an undue irritability of the mucous membranes in general, a condition sometimes attained after the climax of life has been reached, by those who have been surrounded with the comforts and luxuries of competency, and have acquired habits which frequently attach to such circumstances, will probably suffer most in that portion of it which previous disease has rendered the most incapable of resistance. I shall hereafter explain how such are peculiarly obnoxious to the occurrence of spasmodic narrowing of the urethra: and as repetitions of this action very probably lead to the formation of organic stricture, we discover another link or two in the chain of events which connect the remote disease in early life with the lesion now appearing first in age. Thus I have no difficulty in believing that very many years may be expended in the progress of circumstances in the manner described. Still, in respect of the longest intervals recorded, where there is no evidence to warrant us in considering the urethritis as a cause, they must be classified under another head. Such are often spasmodic in the first instance, and some, but very few, may, perhaps, be regarded, at present, as idiopathic; a term which in this place comes rather as an acknowledgment of ignorance of the cause than as any explanation of it.

A remark is frequently made that may not pass unnoticed here. It is said, if gonorrhœa be a cause of stricture, how is it that while the anterior part of the urethra is chiefly affected by the inflammation, the stricture more commonly is found at a distance of about five or five and a half inches from the external orifice? Gonorrhœa, considered as an acute inflammation of the anterior three or four inches of the urethra *merely*, is, indeed, not very often a cause of stricture. Hence we know it is that the majority of gonorrhœas are not followed by it. But if the term be permitted to include circumstances which it frequently gives rise to in certain constitutions, or, indeed, in any, when neglected or badly treated, it most assuredly is so. In these cases the inflammation, instead of disappearing in the course of three, four, or five weeks from the period of its accession, gradually extends backwards to affect chiefly the bulbous portion, and, in a degree which may be termed subacute, lasts there for many months, occasioning a slight discharge which continues in spite of constitutional treatment or injections. The latter may have been freely used, and successfully, as far as the application can be fairly made, which is seldom more than four or five inches down the urethra; but beyond that point the morbid state continues, and treatment is rarely brought to bear upon it. Hence instruments have been contrived, and used with beneficial effect, for carrying injections farther down the canal to stop an old gleet, which would give way to no other remedy. It is the prolonged existence of subacute inflammation, rather than the primary gonorrhœa itself, affecting the bulbous part of the canal, where the morbid action is favoured by great vascularity of the tissues as already pointed out (see p. 80), which is to be regarded as the cause of that deposit, in and beneath the mucous membrane, which, by its subsequent contraction, so commonly produces stricture.

We have now to consider

2. INFLAMMATION ARISING FROM NON-SPECIFIC CAUSES; and, as far as many of these are concerned, it will be unnecessary to do more than name them.

a. Repeated spasmodic contractions of the urethra stands at the head of the list. The nature and causes of these will not be considered in this place, but will be fully discussed in the following chapter. The effects of spasmodic contractions are, however, important; and they may be summed up in one word—inflammation. Unless exceedingly transient in its character, a spasmodic contraction soon becomes complicated with some symptoms of the inflammatory state. Thus it is that some cases of this kind have been misunderstood, and that the words inflammatory and spasmodic have become almost exchangeable terms as applied to stricture. And as far as the treatment is concerned, in the majority of cases, this is of no great consequence, but some there are in which it is widely otherwise. Spasm rarely exists long without an access of inflammation around the contracted part; this, again, increases spasm, which increase, in its turn, aggravates the inflammation. Then the misuse of instruments, under such circumstances, often makes matters worse; and in this manner the foundation is laid for organic stricture. Nothing is more obvious than the fact that a patient already suffering from some degree of stricture becomes permanently worse after every succeeding attack of supervening spasm. And in many cases in which there are no rational grounds for connecting the occurrence of a gonorrhœa, which happened many years ago, with an obstruction to micturition which may have recently and suddenly occurred, we shall often discover, by close attention to the history, habits, and symptoms of the patient, that a condition existed in the first instance, hitherto, perhaps, not sufficiently recognised in general, viz. a spasmodic contraction of the canal, arising from one of the many causes which it will be my object to enumerate and illustrate in the ensuing chapter.

β. SECRETIONS FROM THE FEMALE PASSAGES, as the menstrual fluid, &c.—It is a fact too well established to render it necessary to adduce evidence respecting it here, that urethritis in the male is sometimes caused by contact with the other sex, from discharges which are not venereal in their origin. The source of these may be either in the vagina or the uterus. The menstrual fluid is commonly stated to be the general cause, but so common is the existence of some amount of unhealthy secretion in these parts, arising frequently from want of sufficient cleanliness, together with a relaxed state of their mucous membrane, often depending on an habitually over-heated condition of the organs, from badly-arranged dress, the lower extremities being insufficiently clad, and from the neglect of cold or tepid ablutions, that sufficient cause may exist for the communication of urethritis, especially to a person readily susceptible to the disease, and for its maintenance afterwards, apart from catamenial discharges, properly so called.

γ. ABNORMAL CONDITIONS OF THE URINE, AND ADVENTITIOUS MATTERS CONTAINED IN IT.—Urine may possess an irritating quality from a predominance of acid or of alkali in it. A persistence of either of these conditions must be recognised as one of the undoubted causes of organic stricture. The causes may be but little connected with the urinary function, properly speaking, but have their origin in some error of the assimilative processes. Alkalinity, however, is very frequently the result of partial decomposition of the urinary principle, before explained to be a result of partial retention arising from stricture. But when this is not the case, its irritant effects on the urethra are seen in the signs of inflammation caused by it there; and when any degree of this, however slight, is once set up in any part of the passages, urine deviating in any respect from the normal characters, excites irritation far more readily than before. Thus Sir B. Brodie states that alkaline urine is more likely to produce the disease than that which is acid, and "that persons secreting the triple phosphate are almost sure to have stricture sooner or later."[*]

Mr. Liston says, in reference to attacks of acidity in the urine, "that their continuance or frequent occurrence may lay the foundation for disease of the urethra."[†] Such attacks are the source of much discomfort and irritation in the canal, on which account it is that the use of alkalies allays this condition of the passage, and is of much benefit also when inflammation exists and renders it unusually sensitive.

But urine may not only be rendered irritating by the abnormal quality of its own natural constituents, but foreign matters eliminated by it, which have been taken into the system, may produce a degree of urethritis, and so be ranked among the possible causes of stricture. As examples of these may be mentioned, over-doses of the turpentines, cantharides, bichloride of mercury, &c. A case of organic stricture, arising from a poisonous dose of the nitrate of potash, is recorded in the "Medical Times,"[‡] which evidently occurred in this manner. It is worthy of observation, especially in relation to the subject of treatment, that certain articles of food have certainly a tendency to produce urethral discharge. Malt liquors stand foremost among them. Acid wines and acidulated mixtures of spirit and water have a similar effect. With some individuals especially, asparagus appears to possess the same influence. Hence, in combating urethral complaints of any kind, their use should be carefully avoided.

δ. EXCESS OF VENERY, PROTRACTED ERECTIONS, AND PROLONGED INTERCOURSE, are recognised as causes. The relations subsisting between these and inflammation of the urethra need no illustration or comment.

ε. INJECTIONS (?), CAUSTICS, HORSE EXERCISE.—Much evil has been laid to the account of injections, and doubtless when these have been used injudiciously, *i.e.* of too great strength, inflammation may have been aggravated by their use. But I have no hesitation in asserting that their proper employment is one of the best modes of combating the affection, especially in the chronic form, and thus of preventing the occurrence of stricture. Many excellent authorities might be quoted in favour of this view. I had at first contemplated an attempt to obtain numerical results of their effects in the study of the cases which form the table, but only in the history of two or three, of the entire number, was it stated by the patients that they attributed the complaint to their use, notwithstanding the disposition which patients commonly display to refer the cause of their disease to any particular mode of treatment, rather than to their own indiscretions, while in by far the larger proportion it was stated that their previous gonorrhœas had not been combated by any kind of injections.

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[*] Clinical Lecture, published in the "Medical Times," June 22, 1844.

[†] "Operative Surgery," 4th edition, p. 467.

[‡] No. 324, December 6, 1845.

With regard to caustics applied in the solid form, I have certainly seen some sharp attacks of inflammation set up by their use, and on one occasion, a permanent narrowing of the passage, although certainly not a considerable one, following it.

Horse exercise, as will be seen in a subsequent section, forms a prolific cause of traumatic stricture; but, besides this, its use conduces to the aggravation of a pre-existent chronic discharge. I have met with illustrations of this observation too frequently not to be sensible of its injurious effects when carried beyond moderation.

ζ. Lastly, MASTURBATION is recorded by some writers as a cause of urethritis and stricture, especially by Lallemand. It may be so, but I have never yet been led to trace a stricture to this cause. Ricord's experience leads him to regard it at least as very rarely, if ever, producing such results. Sir Everard Home reports two cases, and speaks of having seen many others, but he classifies them as "spasmodic" only.

THE CONSTITUTIONAL OR IDIOPATHIC TENDENCIES may be regarded sometimes as proximate, but generally as *predisposing* causes.

Some individuals are infinitely more susceptible of inflammation of the mucous membranes than are others. Observation leads us in some instances to connect this predisposition with the co-existence of the scrofulous habit, and sometimes with a liability to attacks of gout and rheumatism. That tumid condition of the Schneiderian membrane, of the lining of the throat, of the internal ear, and of other parts so commonly found in so-called scrofulous subjects, and often accompanied with considerable mucous or muco-purulent discharges, seems to have its analogue sometimes in a similar affection of the bladder and urethra also.

The case cited by Mr. Hunter, in proof of his statement that strictures are not often caused by gonorrhœa, was doubtless a case of this kind. It was purposely quoted at page 101. A youth, nineteen years old, of strumous habit strongly marked, had suffered from urinary disorder for eight years, had been treated for "stone or gravel," and had now a stricture at the membranous portion of the urethra. It is extremely probable that this latter might have been connected with that state of constitution of which other signs were manifested by local complaints elsewhere. Nothing is more certain than the fact that a disposition to difficult micturition, and even a contraction of the urethra, are occasionally, though rarely, met with in young lads. There appears to be a tendency strongly marked in some individuals to irritability of the urinary organs, displayed first in early life, of which no precise explanation can be offered, but which has been sometimes observed to precede the formation of stricture in adult age. The subjects of it suffer as children from obstinate incontinence of urine, particularly during sleep. At all times they micturate more frequently than others do; the urine is discharged in a smaller stream than natural, and it is often unduly acid. With these symptoms, and partly perhaps as a consequence of them, some urethral discharge is occasionally present, or more generally a slight degree of balanitis. In a few years the habit of wetting the bed is exchanged for that of rising to make water twice or three times in the night. More than the ordinary amount of effort is made in order to expel the urine, and the difficulty experienced is greater at one time than another. If such individuals acquire a gonorrhœa, the attendant symptoms are more than ordinarily severe and distressing, and permanent stricture almost certainly follows. This state may be spoken of as one of congenital irritability of the urinary apparatus, but I have no solution of it at present to offer. Such cases deserve attention and care in early life, and will be mostly benefited by improvement of the constitutional powers, as well as by paying particular regard to the skin and ensuring the activity of its functions. Cases in which this constitutional tendency may be more or less traced are Nos. 76, 120, 146, 161, 193, and 200 of the table at the end of the Appendix.

The influence of gout and rheumatism upon the urethra will be more properly discussed under the head of spasmodic stricture, of which they are undoubted causes. These diatheses therefore *predispose* in this manner to the accession of the organic malady.

Rheumatism of the muscles of the perineum, however, is said to be sometimes a direct cause of stricture, and perhaps one that has not been sufficiently recognised. A peculiar inflammation is common to the muscular and fibrous tissues in all parts of the body. The latter, where they surround the joints, or as they envelope the bones themselves, or where they enter into the organization of the eyeball and other structures, are all, as it is well known, particularly obnoxious to it. So also where it is interwoven with the muscular substance to form tendinous aponeuroses, &c. That this condition may affect the muscular and tendinous structures of the perineum and urethra may be regarded as possible. Leroy D'Etiolles believes that he has recognised it. If this be correct, there are a very few cases in which, where stricture exists in this situation, it may have been so caused, perhaps in some of those rare instances in which there is really evidence to show that the malady has made its first appearance during age. This is a point on which I would not venture to assert anything positively, but shall wait for opportunities of further investigation in relation to it.

Having now noticed most of the principal modes in which inflammation may attack the urethra, and illustrated the relation which this action, especially when repeated in its attacks, or of long duration, bears to the formation of permanent constriction of the canal, I may not omit to mention certain conditions which, besides those just named, play the part of predisposing causes. Among these is reckoned the residence in climates which are either extremely hot or cold. The East and West Indies are especially noted as favourable to the development of the affection. Whether this be more than in a very indirect manner I am somewhat disposed to question. Thus, the heat of the day in the torrid zone is often followed by a night in which the reduction of temperature is exceedingly great. To such rapid transitions, rather than to either extreme alone, should most probably be referred any connection which may be traced in this direction. The habits of life also in India are favourable to the production of internal inflammatory complaints, more especially among Europeans, while treatment of disease is often much neglected by the natives. These latter also are said to suffer in gonorrhœa more severely than do inhabitants of the temperate zone. The same influences which predispose to the production of dysentery, doubtless affect to some extent the urethral tract of mucous membrane also, and thus induce a liability to stricture.

I have ascertained that it is the opinion of many whose experience abroad enables them to judge, that on the whole warm climates have some, but by no means any great, predisposing influence in giving rise to the disease in question.

Independent of climate, certain national habits seem to exert a considerable indirect influence in the production of stricture. No one who has had opportunities of comparing the wards of English and French hospitals, will fail to observe that the proportion of cases of organic stricture met with in the latter, is certainly smaller than that which is habitually found in the former. In discussing the circumstances which might account for this fact with other observers, it has been suggested, and probably with a good deal of truth, that the opposite habits, in relation to the kind and quantity of fermented liquors used by the lower classes of the two nations respectively, may fairly be considered as exercising no little influence in the production of the different results.

II. Cicatrizations and Adhesions.

When in the healthy living body any solution of continuity has occurred in the soft parts, occasioning loss of substance, and in which union by the first intention does not occur, another process of reparation is called into action. Albuminous material holding fibrin in solution is poured out, forming a blastema, from which nucleated cells are produced, which elongate, become fusiform, and finally fibrous in their character, and sooner or later the divided parts are united by a peculiar tissue, usually known as the fibro-plastic tissue. The portions destroyed by the injury are not replaced by it, nor are structures otherwise regenerated, so that the gap which remains cannot be filled up, but a stratum of the deposit is thrown out upon its surface in the form familiarly known as *granulations*, over which an epithelial layer gradually makes its way from the surrounding skin or mucous membrane according as the locality may determine. The new tissue is exceedingly pliant at first, but soon grows tough and consolidates, not by any fresh interstitial deposit, but by contraction of the original elements. Examples of this process are daily seen in the cicatrices following external burns, ulcers, &c.

Now the same thing happens in internal parts also. Loss of substance in the mucous membranes, as well as in the skin, is followed by a similar reparative process, and by the deposit of the same strongly contractile material, so that it is common to find narrowing of a mucous canal caused by this action following an ulcerated condition of the part. Thus, among the rest, the urethra is sometimes contracted by its operation. We have sometimes the opportunity of *seeing* this when the ulceration has chanced to occur, either directly at the external orifice, or within a very short distance of it. Case No. 10 is a very interesting example.* Some years ago, at the Hôpital du Midi, in Paris, I saw a remarkable case of single chancre involving the entire external meatus, which was leading to, and would inevitably result in, stricture of the orifice. A sketch of it, which I made on the spot, is now at the College of Surgeons, in the portfolio of drawings which accompanied this work. Since that time I have seen several cases in which ulceration of the meatus has produced stricture. But chancres may be found within the canal as well as at its orifice, in the former case giving rise to a discharge which, although at the time supposed perhaps to be merely gonorrhœal, has been at some subsequent period followed by secondary syphilis in some of its forms. The cicatrices remaining contract and narrow the canal. Ulcerated surfaces may, moreover, heal by *adhesion ;* the mucous membrane of the urethra is, as we have seen, disposed in rugæ closely applied to each other, and from their continuing so constantly, except during the act of micturition, these may be supposed very readily to become united with each other. I have observed longitudinal puckerings of the membrane whose appearance has been strongly suggestive of this mode of formation. I have twice met with chancre at the orifice of the urethra, which, so far from producing contraction, has terminated in a considerable enlargement of the orifice. In each case the chancre involved the lower part only of the meatus and the glans below it, producing some destruction of the soft parts. These examples are interesting as proving the possibility of an exceptional result to the rule which has been long recognised with respect to the action of ulcers at the urethral meatus.

Again : the mucous lining of this canal is doubtless susceptible of the ordinary abrasions and ulcerations to which it is liable elsewhere.

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* Also see Prep. No. S. 78, in Museum of St. George's Hospital. Described in the Appendix. An outline of the history accompanies it, forming an admirable illustration of the text.

By a variety of mechanical causes it may sustain injury. The discharge of matter from an abscess into the urethra also has been observed to be followed, some time after, by symptoms of stricture, doubtless from the destruction of mucous membrane, healing of the orifice, and its subsequent cicatrization.

Blows on the perineum, lacerating the urethra, form a prolific cause of very severe stricture. These are received in many ways. Among sailors it is common to meet with such cases. A man falls from the rigging of a vessel, and alights, with his legs apart, across a spar or some similar object. Hæmorrhage from the meatus, sometimes very considerable in quantity, announces that the urethra has been injured; probably retention occurs; and instruments can rarely be used to relieve it, without the hazard of inflicting some additional laceration. Usually, in the course of a few weeks, symptoms of stricture appear; and, ere long, the patient is afflicted with one of the most unyielding, tight, and obstinate strictures it is ever our lot to treat. Such a patient is never safe. A slight deviation from his ordinary habits of diet, exposure to cold, and the like, are at any time sufficient to cause retention of urine and its consequences. In this case, also, the constriction is due to the contraction of the cicatrix, as well as, in some measure also, to irregular adhesion of the lacerated edges.

A fall, without a direct blow on the perineum or adjacent parts, may lacerate the urethra. I have recently met with one instance of stricture so caused. It originated in a fall from a height of several yards, in which the individual alighted on his feet, but which were widely separated from each other, no blow being received upon the perineum. The usual symptoms of lacerated urethra followed.

Not only in the manner described, but in many other ways, are contusions and other injuries inflicted: blows on the body, falls from scaffolding, the slipping of the feet through ladders, falls upon carriage-wheels in the act of mounting or dismounting; all these are causes which I have personally met with in practice. The urethra may be lacerated or cut across in punctured and other wounds, and thus may be altogether obliterated. I have known children thus to suffer by the breaking of earthenware utensils beneath them. Adults meet with similar injuries by falls on palisading; in the country by crossing fences, from pointed stakes, and the like. Several instances of these causes I have observed, and recognised as giving rise to most obstinate strictures. Injuries, in which fractures of the pelvic bones occur, are liable to cause laceration of the urethra. Miners, and others engaged in excavations, are particularly obnoxious to accidents of this kind, as from the fall of a bank of earth upon them, &c.

Horse exercise is a prolific source of injury to the urethra. Hence cavalry soldiers are particularly obnoxious to the affection. The habit of riding without saddle, in order to ensure a firm seat, which is frequently practised for an hour and a half daily, and often upon the sharp back and withers of a large and bony animal, with high action, is a frequent cause of urethral laceration. I speak on the authority of my own observation of several such cases. In hard riding and leaping, as in hunting, a blow from the pommel of the saddle has been known to produce the same result.

Laceration of the urethra has not unfrequently been occasioned by violent chordee, sometimes occurring spontaneously; sometimes, it is said, arising from efforts to "break the chordee" resorted to by the patient himself, in order to effect its cure. Of the former class, I have met with an occasional example. Violent hæmorrhage has relieved, for the time, an obstinate chordee, soon after which signs of stricture have gradually appeared. It is not improbable that in such cases the urethra has been ruptured, and the erectile tissue of the corpus spongiosum itself lacerated; the rapid and considerable flow of blood which follows the accident can scarcely be accounted for otherwise. This opinion is confirmed by the intractable character of the stricture which is prone to result, and that at no very remote period.

The application of instruments in the treatment of diseases of these parts is, it must be confessed, also an agent in the production of stricture. It is impossible to insist too strongly on the employment of the greatest care, tact, and delicacy in the management of sounds and catheters in the urethra; and the habit of passing them roughly and unnecessarily cannot be too strongly reprobated. Worst of all is the employment of force under circumstances of retention or narrow stricture, in which cases the care, gentleness, patience, and forbearance of the operator should be manifested just in proportion to the obstacles and difficulties which have to be encountered. The temptation to use force is very strong, especially to one who is inexperienced in the art and practice of catheterism.

Nothing can be more dangerous, at all events in his hands. The history of many a case demonstrates that the aggravation of the symptoms experienced after each succeeding attack of retention, has been often greatly due to the harsh usage the urethra has been made to undergo at these periods, in the form of reiterated attempts to pass a catheter, first by one hand, then by another, and afterwards, perhaps, by a third; each, probably, over-emulous to become the successful (?) operator. Those who have witnessed such scenes, and their injurious consequences, will best understand the force of these remarks.

I might enlarge to almost any extent upon the ill consequences of forcible catheterism, and upon the complications introduced by it into cases of simple stricture. Let an examination of a large proportion of the preparations of the disease found in every Museum suffice to warn the young surgeon of the irreparable mischief he may in one short minute inflict by a transient loss of temper, or forgetfulness of the golden rule in catheterism, "*arte non vi.*"

The passing of calculi by urethra, especially of the angular fragments which are expelled after lithotrity, has been known, though very rarely, to become a cause of stricture. So has the laceration of the passage by the use of the lithotrites themselves.

Division of the urethra from the perineum or elsewhere, not being sufficiently treated by dilatation afterwards, may be followed by *irregular* adhesion of the cut surfaces, and thus to some constriction of the passage, but not otherwise. Hence it is a most important point in the management of such a case not to lose sight of the patient altogether, for a certain period after. The beneficial result of the operation may be lost for want of a little attention at occasional intervals afterwards. The section made in the lateral operation of lithotomy has been observed to cause stricture in one or two instances, on the authority of an American surgeon. This must be a very rare event, and I have never met personally with any one who had traced it as a cause. Admitting the cases mentioned, its very exceptional occurrence proves how constant is the rule, that lithotomy does not reckon stricture among its consequences.

Amputation of the penis by the knife, or loss of a portion of the organ by phagedænic ulceration, or cancer, is often followed by a very intractable narrowing of the orifice of the urethra, unless most carefully and constantly provided against, either by operative measures or by dilating at a sufficiently early stage of the case; and then the opening is still liable to contract. Of cancerous ulceration affecting the penis and causing narrowing of the canal, there is a preparation in the Middlesex Hospital Museum (No. XI., 27). See Appendix.

III. GROWTHS.—This subject has been fully discussed under the head of the "Pathology of Organic or Permanent Stricture," pages 70-76.

IV. CONGENITAL IMPEDIMENTS.—Narrowing of the meatus sometimes occurs as an error of formation; sometimes, also, as a complication of congenital phymosis. Such contractions may be situated either at the orifice or at any distance from it, along the course of the canal, varying from a quarter to three-quarters of an inch. In almost all cases the obstruction consists of a simple fold of membrane, stretching across it to a greater or less extent, and generally arising from the floor of the urethra. When congenital hypospadias exists the orifice is almost invariably small.

Total absence of the anterior part of the canal is sometimes met with, affecting portions of variable length in different cases.

Constitutional, or indeed congenital, irritability giving rise to stricture has been already considered, pages 116, 117.

Before proceeding to the next division of the subject, a complete analysis of the table referred to is subjoined, with relation to the *causes of stricture*, and to the connection which exists between a gonorrhœal attack and a subsequent stricture.

ANALYSIS OF 220 CASES OF STRICTURE, FORMING TABLE AT THE END OF THE APPENDIX.

ANTECEDENTS, OR SUPPOSED CAUSES, OF ORGANIC AND PERMANENT STRICTURE.

Gonorrhœal Inflammation in	164
Injury to Perineum	28
Cicatrization of Chancres	3
Ditto following *Phagedæna*	1
Congenital, including cases in which the urethra may have been small from malformation, and those in which marked irritability of the urinary organs existed from childhood, accompanied by an unusually small stream	6
Poisoning by Nitrate of Potash, *Lithotrity*, *Masturbation*, of each *one* (Lallemand), met with among the ordinary published cases in the journals	3
True Inflammatory Stricture, including *Temporary* Stricture and Retention from a sudden acute inflammation, usually caused by some excess, and disappearing by resolution	8
True Spasmodic Stricture, caused by irritations about the rectum	2
,, ,, No cause assignable	2
,, ,, Caused by undue acidity and alkalinity of the urine	3
	220

Respecting the first class of cases the following facts are elicited:—

Of the . . . 164 cases attributable to Gonorrhœa,

In . . . . 90 the disease is reported to have been *chronic or neglected.*
In . . . . 3 it was attributed by the patients to strong injections.
In . . . . 6 the discharge is stated to have ceased entirely and rapidly under treatment; but in 5 of these stricture appeared almost immediately after.
In . . . . 4 other cases the stricture appeared to be almost simultaneous with the gonorrhœa.
In the remaining . 61 there is no report of chronicity, &c.

Of the 164 cases attributable to Gonorrhœa,

10 appeared immediately after or during the attack;
71 ,, *within* 1 year of its occurrence;
41 ,, *within* 3 or 4 years;
22 ,, *within* 7 or 8 years;
20 are reported at periods between 8 and 20 to 25 years.

CHAPTER V.

THE PATHOLOGY OF STRICTURES WHICH ARE ONLY OF TRANSIENT DURATION.

1.—The nature, causes, and symptoms of SPASMODIC STRICTURE—Variations observed in the symptoms of permanent stricture—Causes of spasm, existing in the urethra itself; in general conditions of the system—Spasm may occur when no appreciable lesion of the urethra is present—Opinions of Brodie, Hunter, Guthrie, Phillips, and Hancock—Spasm of the accelerator muscle—The true sources of spasmodic stricture—The exciting causes of spasmodic stricture—Slight organic constriction the most frequent cause—The influence of rheumatism and gout—Other signs of the gouty diathesis to be sought for—More commonly observed among the higher classes of society—Inflammation and spasm usually co-exist—A case—Specific irritants of the urethra—Violent exercise—Unusual distension of the bladder—Calculus in the bladder—Hæmorrhoids and painful affections of the rectum—Disordered stomach and bowels—Mental emotions—Symptoms sometimes periodical—The essential character of spasmodic stricture in its transient duration—Principles of treatment—2.—INFLAMMATORY STRICTURE—Essential elements of—Symptoms of—Strictures of the urethra cannot be referred to partial injection of the erectile tissue—Hæmorrhagic tendency of some strictures—Habitual congestion of the part—Other vascular conditions related to congestion—Treatment—Illustrative cases.

1. THE NATURE, CAUSES, AND SYMPTOMS OF SPASMODIC STRICTURE.

It will perhaps have been observed that in detailing the local symptoms of the permanent stricture, little or no allusion was made to the circumstance that frequent variations in the size of the stream of urine may and do occur, independently of occasional attacks of retention; and that a patient will often relate, of his own accord, that although the current is always considerably smaller than it was when he was in health, yet, "*that it comes much more freely on some days than on others.*" To what is this fact due? That it is a fact is notorious, and one of common occurrence. Its solution frequently lies in the anatomical structure of the parts, which were, on this account, so fully described in a former portion of this work; and the reader is referred to certain propositions briefly, but comprehensively and clearly expressed, for the sake of bringing together the facts respecting the subject into one short space, so as to facilitate recollection or reference (*vide* pages 44, 45).

Thus we now know by demonstration that which has been long suspected to be the fact by many observers, viz. that a portion of the urethra already narrowed by some plastic deposit, is liable to have its calibre temporarily diminished by the action of the involuntary muscular fibres which surround it, *in whatever part of the canal it may be situated;* and this circumstance, not depending on any voluntary effort, is the result of some irritation of the sentient nerves of the part, transmitted by them to a nervous centre, which, according to their connections, may be either the spinal cord, or some ganglion, whose function it is to reflect the impulses of the nerves in question to the motor branches, by whose agency that contraction of the muscular fibres is induced which we call "SPASM," which term is employed to denote irregular involuntary contraction of muscle, whether of the striated or the non-striated variety.

This irritation may occasionally be traced to abrasion of the mucous membrane at the strictured part, or to its exalted sensibility only, so that an increase in the acidity or acridity of the urine is in some patients an amply sufficient cause of excitement to the reflex act described. Thus the presence of a foreign body, as of a small calculus, of a sound (especially if it be *cold*, the stimulus of which state is then superadded), of injections, &c., &c., all tend to cause reflex contractions in a greater or less degree, corresponding with the amount both of local and general nervous mobility, which belongs to the particular constitution or idiosyncrasy of the patient.

Again, not only do local irritations act on the calibre of the urethra, but general states of the system also, as they influence the condition of all the muscular fibre throughout the body, must of necessity dilate or contract these muscles in particular, and so *tone*, and the want of it, are manifested here also. External cold or heat produce effects opposite in their character; an attack of general rigors being always attended with a small stream, and the converse condition of the body, as when relaxed by heat, giving rise to a large one. Internal vascular congestion is at the same time caused also, and doubtless assists in producing these symptoms.* We can,

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* Among innumerable illustrations which might be adduced, the following will suffice :—

A policeman, who had been the subject of slight organic stricture for three or four therefore, scarcely expect to find a case of organic stricture which does not occasionally experience to some extent the effects of spasmodic influence, and this statement observation fully corroborates. Hence the variations in the size of the stream of urine to which I have alluded.

These remarks naturally bring about the question which we have next to consider, viz. does spasmodic stricture of the urethra occur, apart from the presence of some organic contraction of prior existence, however slight? A question the reply to which, although glanced at in the commencement of the chapter on pathological anatomy, is more properly discussed while considering the symptoms of transient obstructions.

It may again be replied that it does; and further, that such cases are not exceedingly rare, but that in by far the greater number of them some local lesion, however slight, exists, although it may not be one having any relation to organic contraction strictly so called. Still there are undoubtedly some few others in which the exciting cause eludes the evidence of the senses, to be explained only by supposing that cause to take its origin in the nervous centres themselves, producing phenomena of "*centric*" rather than of "*eccentric*" action, a conjecture which is quite in harmony with what we know of the laws which govern the nervous system, and with the analogies presented by the irregular actions of muscle in other parts of the body. To this category, without doubt, may be referred those cases which are described by some writers as examples of "pure spasmodic stricture," and which they regard as of extremely rare occurrence.

Thus, Sir B. Brodie says,—"Instances are not wanting of persons who have been for a considerable time liable to occasional attacks of retention of urine from spasmodic stricture of the urethra, although in the intermediate periods there was no perceptible diminution of the stream of urine, and hence we are justified in the conclusion that a spasmodic stricture may exist independently of any actual organic disease. At the same time it must be acknowledged

years, when subsequently under the care of the writer, related of his own accord that he habitually went on duty early in the morning, and in the winter-time suffered much from cold; that the presence of his stricture was always much more apparent during that part of the day, but that when he had become thoroughly warm the difficulty in making water almost vanished. Shortly after, he got an obstinate attack of retention on one of these cold mornings, and the stricture has been narrower ever since.

that the existence of a purely spasmodic stricture is of rare occurrence." *

Mr. Guthrie states, that he has only met with one such case.† Both refer the phenomena to spasm of the compressores urethræ muscles.

John Hunter directly states that "there are often spasmodic contractions of these muscular fibres *in different parts* of the canal, shutting up the passage and obstructing the course of the canal, and often not allowing a drop to pass." ‡

Mr. Phillips says,—"Despite the contemptuous denial made by some authors, of the existence of spasmodic constrictions of the urethra, and of the obstacles which they present, spasmodic constrictions really exist, and ought to fix the attention of the surgeon. Occasionally, in the operation of catheterism on irritable subjects, we find that the sound is apparently grasped and held with force by the parietes of the canal, so as almost to prevent the advance or retreat of the instrument."§

And again: "Although I believe the seat of spasmodic constriction to be in that portion of the canal so nearly, and in some cases so entirely, surrounded by the acceleratores urinæ and Wilson's muscles, yet, in highly irritable urethras, it is not unfrequently found that the engorgement of the mucous membrane is so considerable as to arrest the instrument at two, three, or four inches from the orifice, and to simulate the character of true stricture. We have seen, and have ourselves taken casts at these different situations, the patient having no other obstacle than spasmodic contraction of the urethra."‖

Mr. Hancock "believes, in opposition to what has been advanced by Sir B. Brodie, that a spasmodic contraction of these organic fibres may take place in the anterior part of the urethral canal, even within an inch from the orifice, and also that it may exist as a primary and independent affection, without a spasmodic affection necessarily existing at the same time in the membranous portion."¶

It will be unnecessary to bring forward additional testimony in support of the views which have here been taken, in reference to the existence of spasmodic contractions of the urethra. It will be obvious, however, from the above extracts, and also to any one who has paid any attention to the literature of the subject, that while the occurrence of spasmodic narrowing of the urethra is almost universally admitted, yet there is a want of clearness in the accounts of writers in general respecting the pathological condition involved by that fact. As before seen, Sir B. Brodie and Mr. Guthrie, recognising in the existence of spasm the necessity for a muscular apparatus to produce it, at once refer it to the action of the compressor urethræ muscles, and therefore limit its occurrence to that small portion of the canal about three quarters of an inch long, which lies between the two layers of the deep perineal fascia. Yet their accounts of the phenomena of catheterism, as well as those of all writers on the subject, who with any amount of graphic power record their experience of urethral exploration by means of the sound, impress us clearly enough with the idea that the instrument is often "grasped" before it reaches the point just named. We even hear of "spasm" in these parts from those who deny their muscularity. How is this to be accounted for? Some not very definite statement about the vital contractility of the walls of the passage displaying itself on the approach of a foreign body, is offered as the solution of the problem, a power which, as it is intended distinctly not to convey the notion of muscular contraction, and to indicate something more than mechanical elasticity, means nothing. Others, still describing the phenomenon by the term *spasmodic* constriction, explain it as consisting in an unusual distension of the vessels of the mucous membrane, or of the erectile tissue, occasioned through the excitement produced by the approach of a foreign body, as of a sound, &c. This is paradoxical, to say the least.

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* Sir B. Brodie on the "Urinary Organs," 4th edition, p. 6.

† Guthrie, op. cit., p. 45.

‡ Hunter, op. cit., p. 229.

§ Phillips on the "Urethra," p. 131.

‖ Phillips on the "Urethra," pp. 132, 133.

¶ Mr. Hancock's Lettsomian Lecture for 1852.

Lastly, some have referred the phenomena in question to a spasmodic action of the accelerator muscle, but I think few who have enjoyed any experience will hesitate to acknowledge that some contractile force is often exerted by the urethra upon an instrument, before it comes within the range of any of its fibres. Moreover, it is to be doubted whether that muscle can exert *much* influence upon the calibre of the urethra; I should be inclined to think that its power must be very inconsiderable with so much erectile tissue intervening between the muscle and the canal. At all events the influence of its contraction must be greatly deadened and diffused, certainly incapable of producing that close grasp, which is a sensation impossible to describe, although perfectly understood by any one who possesses practical acquaintance with the subject.

We come at last to the simple fact, which will explain the apparent discrepancies in the observations referred to, viz., that there are two sources of contractile power which may narrow the calibre of the urethra; one, in the involuntary unstriped muscular fibres which are applied to the whole course of the canal; the other, in the voluntary muscles which closely encircle the membranous portion only; in addition to which, a certain number of voluntary muscles possess in a much smaller degree, and in an indirect manner, some influence over the calibre of the canal also. The details of this subject have been fully entered into in the section relating to the functions of these muscles.

Let us bear in mind that we have general contractility pervading the whole canal, besides a sphincteric muscle which acts specially on one part of it, and we shall find a key to the phenomena, the exciting causes of which it is now our province to enter upon the consideration of.

THE EXCITING CAUSES which may give rise to spasmodic contraction of the urethra are numerous. It has already been suggested that they naturally arrange themselves into those which result from some local lesion, which, in accordance with the laws of reflex action, we have termed ECCENTRIC spasmodic contractions; and those in which this is not present or appreciable, and which may be supposed (to carry out the same principle of nomenclature) to have a CENTRIC origin, these latter giving rise to those rare cases which have been called pure spasmodic stricture, a term which, however well understood, is by no means a correct one, if intended to designate a case in which the spasmodic action is one whit the more perfect or free from complication, or "pure," inasmuch as it is only one in which the exciting cause eludes our intelligence. Whether this cause be at the centre or at the periphery; whether arising from a partial organic contraction or from functional derangement of a nervous centre, the action is equally spasmodic, and as purely so in the one case as the other.

Among the eccentric causes, none is so common as partial organic contraction; that is to say, a permanent stricture being present, however slight may be its extent, the canal is liable to be narrowed, or even occluded at any time: hence the varying size of the stream in such patients, which has been already alluded to. A reference to several cases reported will exemplify this statement. If this, by itself, can give rise to spasmodic contraction, of which there can be no doubt, we have, *à fortiori*, a more potent cause when there exists in addition any abrasion or ulceration of the mucous membrane at the part. Again, these conditions may exist without the presence of stricture; thus there may be an ulcer within the urethra; laceration from injury, causing spasm; abrasions arising from instrumental operations upon it, as with simple or armed bougies, or with cutting instruments of any kind, dilating instruments, &c. Acting especially in concert with such lesions is the passage of the urine over the denuded and sensitive surfaces, which becomes a still more fruitful cause if its characters be altered from those of health in any way. It may abound in acid, or be ammoniacal, which condition is still more irritating than the former. It may be merely more concentrated than natural, in all which cases the injured membrane is irritated, and the supervention of spasm is favoured. In this manner the narrowing of the stream in gouty conditions of the system may be accounted for, the co-existence of which states is a fact well established. Nevertheless it is one which has been insufficiently noticed, still less elucidated, by writers on this subject, partly perhaps because the *rationale* was not evident, or was at least only hypothetical, until the fact of the muscularity of the urethra was no longer a theory but an established truth. There are certain diatheses known in common parlance as gouty, or which are more frequently described by combining the two terms, rheumatic and gouty, which exhibit certain prominent characters, and of these the following are among the most obvious and most readily recognised. They usually appear in individuals who are approaching the meridian of life (although exceptions to this rule do occur), men who have habitually lived well and freely, not necessarily given at all even to occasional excesses, but, on the contrary, whose habits may be extremely regular, that regularity including the moderate but constant enjoyment of all the luxuries which an exceedingly well-furnished table supplies. In such there exists, very commonly, a tendency to undue irritability of all the mucous membranes of the body, at first perhaps most apparent in the gastro-enteric or gastro-pulmonary, particularly the former, and evidenced by the irritable dyspepsia to which they become subject. A predominance of acidity is very marked in the secretions, its amount however greatly varying at different times. Thus in seasons favourable to activity of function on the part of all the excreting organs, the skin especially, they have not much to complain of, but if transpiration from the surface be checked, a greater amount of labour is thrown upon the kidneys and liver, and the urine abounds in acid, is loaded with lateritious deposit, and calculous matter may even appear in considerable quantity. In the spring of the year, dry and chilling east winds greatly affect such patients; rheumatic pains are felt, and derangements of the chylopoietic viscera occur, and the results of malassimilation manifest themselves in the urine in the manner just described. And as their genito-urinary mucous membranes seem to possess, in common with the others, an extreme susceptibility to irritating influences, we very commonly find the stream of urine considerably diminished in size, sometimes leading to unusual difficulty in micturition, and to an unnaturally frequent desire to perform it, which accordingly sends the patient to his surgeon, and if the latter do not regard this symptom as the primary affection, but have been led by observation to recognise in it a sign only of that assimilative derangement which has been alluded to, he will not have much difficulty in relieving it, but otherwise, should he treat only the supposed organic local affection, it will baffle his attempts to reduce it by any of those means which are commonly made use of for such a purpose, and the urethra will certainly reap no benefit from the repeated efforts to cure by mechanical treatment only. See Case 4, at the end of this chapter.

It is desirable to bear in mind, in relation to such patients, that other signs of the diathesis in question should be looked for. Not always, indeed it may be said unfrequently, have they suffered from any direct attacks of gout, so called. Nevertheless symptoms are often manifested which leave no doubt whatever as to the true nature of the case, and which are those usually recognised as characteristic of the disease in its "*masked*" form. Thus, palpitations of the heart frequently occurring, and restlessness at night, but especially the former, strongly indicate, in connection with the symptoms described, the presence of the gouty tendency, and should lead the attendant to pay special attention to the characters of the urine. Much irritability and vascularity of skin is commonly present; eruptive complaints of a chronic character often co-exist, as psoriasis, acne, &c. And thus we find the advent of the difficulty in micturition preceded in some cases by a disappearance of the eruption; an occurrence not overlooked by some of the older writers on urinary complaints. Again, in others, the urethral irritability may give rise to a puriform discharge which may be recognised as a catarrhal affection of this mucous membrane, analogous to that which most commonly affects the bronchia and nares, depending upon an inflammatory condition of it, the remote cause of which has been a check to the perspiration through exposure to cold, while the immediate or local determining cause is the irritation of a highly-sensitive mucous membrane by unusually acid urine. In the same manner we know that a "cold" may cause subacute gastritis and dyspepsia, or diarrhœa, or a throat affection simply, or an irritable bladder; the affection being determined to the weakest division of the mucous membrane, according to the idiosyncrasy of the individual.

The cases we have been describing are rarely to be seen at hospitals, being found usually in the higher classes of society. Hence their rare appearance in those reports, which are so valuable in researches respecting diseases, is perhaps another reason why the dependence of spasmodic constriction of the urethral canal upon the uric acid diathesis has received less attention from writers than it deserves. And inasmuch as it affords the means of solution to many phenonema which have been considered anomalous and irregular, it is to be esteemed one of the most important relations in connection with our subject. Further evidence of the truth of these views respecting the connection which exists between gout and some vesical and urethral affections, if more be wanting, might be adduced from the fact that they are amenable to the treatment which is most adapted for gout in its commonest and most recognised forms. All the signs of stone in the bladder (of course excepting that of actual contact with the sound itself), as well as the symptoms of stricture of the urethra, not unfrequently result simply from the presence of urine loaded with acid, and an irritable mucous membrane, and may, in such cases, be entirely removed by the judicious exhibition of mild mercurial alteratives, or of colchicum and alkalies, above all combined with strict attention to diet and the action of the bowels.

Thus the sensibility of the urethra may be greatly exalted, and yet no solution of continuity exist. We well know that when inflammation is present in a part, its sensibility is greatly increased, and that the contact of agents, which in health is disregarded, becomes painful and distressing to the feelings. Hence the frequent occurrence of temporary obstruction to micturition in acute urethritis. Yet only sometimes does inflammation by itself occasion retention, its effects extending merely to the *narrowing* of the canal, not frequently to its entire *occlusion*, unless the urinary organs are subjected to some additional or extraordinary sources of irritation. These two circumstances not unfrequently occur together thus:—A young man has suffered from an attack of gonorrhœa, which is now disappearing; the painful symptoms have subsided, and only a little discharge and some pain on erection remain. He has been "*keeping quiet*" for three weeks or a month, and has rigidly followed the directions of his medical attendant, to avoid alcoholic drinks and stimulants in every form. This self-denial is becoming exceedingly irksome to him. It was not difficult to impose while frequent and scalding micturitions, and the annoyance of a profuse discharge, rendered enjoyment in society impossible. He yields to some pressing invitation to make one at a dinner-party, and with the increased zest which follows prolonged abstinence, and the happy consciousness of fast-approaching convalescence, he partakes freely of the good cheer before him; and in the excitement produced by it, and by the society around, all thoughts of restraint vanish, and liquors in variety, and condiments of all kinds, are fully indulged in. Some time after, and not perhaps until hard pressed, he finds an opportunity to empty his bladder, which has been filling fast meantime, under the diuretic influence of champagne and claret, with perhaps in addition, punch (the most dangerous of the three). It is now discovered to him, and that most unexpectedly, that he is without power to relieve himself; repeated efforts are made, and a few drops pass; but each attempt only convinces him of the fact that retention has taken place. Meantime the bladder becomes more distended, and pain throughout the hypogastric region and loins grows most distressing. Restless and unrelieved, he moves about constantly, unable to stand upright, the body being more or less bent to relax the abdominal muscles, and so prevent pressure, by their tension, upon the bladder, and accommodate the abdominal cavity to the increasing size of the viscus. Anxiety is manifested in his countenance; efforts at straining are made, more involuntary and reflex than otherwise; perspiration breaks out and grows profuse; the head is hot, the face sometimes flushed, at others pale; the heart's action is violent at times, and a conscious fear of impending danger leads the patient almost to despair of the possibility of relief. At some periods his efforts become agonising, almost unbearable; and most fervently does he implore assistance from those around him.

Not many causes of bodily suffering are more potent to produce it, in its most exquisite form, than unrelieved retention under these circumstances.

The causes to which the phenomena of such a case may be attributed are three; viz., the recurrence of the local inflammation mechanically narrowing the passage, in the first place; a contraction of the involuntary muscular fibres, occasioned by the contact of altered urine secreted in these circumstances with the mucous membrane, as well as of those voluntary muscles which encircle the passage, and whose contraction appears to be strongly and unnaturally excited when powerful but uncontrollable strainings to relieve the distended bladder are made by the patient. Lastly, the disturbed condition of the system at large, produced by the ingestion of stimulants, induces a more mobile condition of the nervous system, a state in which its tendencies to act are increased, and its sensibilities exalted; which circumstances simultaneously acting and reacting upon each other, bring about the results described.

Under the head of altered urine, as a cause of spasm, may be noted the effects upon it of cantharides, the turpentines, spices, condiments, &c., all of which may, probably through the agency of direct contact, irritate the canal and cause constriction of it. It cannot be certainly said that direct local contact is necessary to produce this effect, since it may arise through the action of the irritant on the nervous system primarily, since the same results have taken place in the case of cantharides when applied to the skin as when taken by the mouth. Or the elimination of the active principle by the urinary organs. may, by bringing it into direct contact with the mucous membrane, occasion the constriction: a mode of action which our knowledge of the pathological condition of these organs, in cases of poisoning by it, would rather lead us to believe is in such cases that which takes place.

Reasoning by analogy, we should expect to find certain irritants causing contraction of the involuntary muscular fibres of the urethral canal. Thus, temporary stricture of the œsophagus is well known to occur, and its spasmodic source is recognised by the same character, viz., its transient duration.

Thus, again, we have spasmodic constrictions of the intestine, of the muscles of the tracheal and bronchial tubes, and probably, more or less so, of all the involuntary muscular fibres in the body, which, as similar cramps and spasms elsewhere, may be occasioned through the agency either of direct or remote irritations.

But although the history given is the type of a class of cases which frequently occur, it by no means presents the only causes which occasion spasmodic constriction.

Thus we find it brought about by violent exercise, such as hard riding on horseback, straining to lift heavy weights; sometimes by the venereal orgasm. All these may be, and doubtless sometimes are, due to congestion in the first place, rather than to spasm, and are to be considered under that class of obstructions which depend chiefly on vascular changes; but that muscular action has its share in producing the effect, seems highly probable.

Another cause of spasmodic contraction, and without doubt, of the compressor urethræ muscle, is the state which follows an unusual distension of the bladder, occurring sometimes as the consequence of inability to micturate, through want of convenience or privacy for the purpose. Circumstances connected with society, the restraint of a stranger's presence, the want of urinals in the public streets and in places of general resort, are by no means unfrequent causes of such distension; and the attempt to relieve it, when opportunity subsequently offers, is sometimes unavailing. This has been attributed to atony of the muscular substance of the bladder arising from overdistension, or to a co-existence of this with the spasm aforesaid. It is probably due, in most instances, to both causes. The possession of some contractile power by the bladder, and flaccidity of the parts about the urethra, are the conditions necessary to free micturition. But unless some obstruction in the passage coincide with the atonic state of the bladder, it is difficult to conceive why the distended viscus, acted upon by the pressure which the abdominal walls cannot but exert upon it, at least, while in that condition, should not relieve itself, at all events to a considerable extent. The retention, however, in such a case may be attributed partly to spasm of the compressor urethræ, a phenomenon, the occurrence of which seems induced, or at least facilitated greatly, by the condition of the bladder described, and partly to the somewhat altered position of the urethra itself, the curve of which beneath the pubic arch is rendered more acute and angular, as well as to increased length of the neck of the bladder from the stretching of the vesical coats in the direction *upwards*, in which course, almost solely, distension must of necessity proceed.

The presence of foreign bodies in the urethra has already been referred to in the case of sounds and similar instruments, as a cause of contraction on the part of the muscles both voluntary and involuntary, so that it is unnecessary to repeat any remarks on that subject.

The irritation of a calculus in the bladder will sometimes cause spasmodic contraction and narrowing of the stream through sympathy, as it is termed, which occurrence is not to be confounded with that sudden interruption to the flow which is attributed to the drifting of the stone against the orifice of the urethra within the bladder; the former being found connected with much local sensibility of the part, and that general irritability of the nervous system which is its accustomed concomitant.

I have hitherto chiefly referred to causes connected with irritations *within the canal* or with the urine itself. But spasms of these muscles may occur through excitement existing elsewhere, and not in the urinary or genital system at all.

Thus the presence of hæmorrhoids, especially when inflamed and causing tenesmus and excessive contractions of the sphincter ani, is sometimes a cause. So occasionally also are rectal fistulæ. Operations about the anus, particularly that for the ligature of hæmorrhoids, are frequently followed by retention of urine from sympathetic muscular contraction. That excessively distressing affection, fissure of the rectum, or irritable ulcer, is not less liable to occasion a similar difficulty. The connection and sympathy existing between the sphincter ani and the compressor urethræ have been before alluded to (pp. 84–5), of which such cases become an additional illustration. A similar condition of things has been known to result from the presence of tape-worm in the intestines,[*] also from that of ascarides in the rectum, the intense itching which the latter occasion giving rise to it. The distressing prurigo about the anus and genital organs which affects elderly people more particularly, has been recognised as an undoubted cause in like manner.

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[*] An example of this kind is recorded in the "Medical Times" for April 26, 1848. It was originally reported by Mr. Tuffnell, in the "Dublin Medical Press." That gentleman describes the patient as coming under his care with marked symptoms of irritable bladder and stricture of urethra. The latter was recognised as existing "at the membranous portion of the urethra." After rest and medical treatment, which appeared to be strongly indicated, the patient greatly improved, but on relinquishing attention to

Derangements of the chylopoietic viscera may be in some few instances primary causes of the spasm. That they are fruitful sources of cramp in other voluntary muscles is too well known to be doubted, and we may by analogy admit their influence here, especially when cases not admitting of solution on other grounds, and seemingly connected with some gross errors of diet, are presented to our notice. Anything in fact which gives rise to the phenomena which we understand by the term convulsive action, whether originated by mental or bodily excitement, or by both combined, *may* be a source of spasm in the urethra.

It is not surprising that mental emotions should sometimes interfere with the function of micturition, when we recollect how intimately united are the bladder, urethra, and their muscles, not only to the cerebro-spinal centres by an ample supply of spinal nerves, but also to all the other viscera, abdominal and pelvic, by the abundant interlacement of those organic nervous fibres, by which system and its numerous ganglia, influences are propagated and sympathies excited between each, so that one function can scarcely suffer to any extent without more or less implicating another; it may be, arising from some want of accurate consent or harmony in the series of acts which are necessary to produce most movements in the animal economy, however simple such may appear to the casual observer. Here and there a case certainly occurs which seems to admit of explanation only on such grounds.[*]

Very rarely indeed a narrowed condition of the urethra has been observed to occur at periodical intervals of twenty-four or forty-eight hours, and to yield, after the failure of other means, to the influence of quinine. One such case is recorded on the authority

these, a complete relapse took place. At last, the presence of tape-worm being suspected, appropriate remedies were administered, and one of these animals, "measuring thirty feet, was evacuated." The following sentence then closes the report:—"All the former symptoms immediately subsided, the urine became clear and healthy, and the patient was soon restored to permanent health."

[*] Sir A. Cooper, in his lectures, says,—"Even an irritated state of mind, or a mind deeply engaged in study, will occasionally influence the nervous system to such a degree as to produce spasmodic stricture of the urethra."

of Sir B. Brodie, in the first volume of the "Medical Gazette," page 107.*

The grand distinguishing feature which marks the phenomena we have thus ascribed to irregular muscular contraction, and by which they are contrasted with those of organic stricture, is their TRANSITORY CHARACTER. The symptoms of a narrowed urethra may *repeatedly* occur, but at times it is evident enough that the canal possesses its natural degree of patency. This is never the case in the presence of organic stricture; the stream then varies, but it never assumes the natural size.

It will be manifest now, in relation to the subject of treatment, that general principles must be kept in view, and applied according to the particular requirements of each case. Local treatment of the urethra itself is of secondary importance, often unnecessary, sometimes indeed prejudicial. The first and main thing, as in all spasmodic affections, is not to regard so much the sign or symptom itself as to investigate the cause, a correct appreciation of which is the only key to successful treatment. This must be carefully sought, not only in the urinary track, but in adjacent and allied organs, and in the condition of the system at large. Speaking in general terms, it will be found that attention directed to the condition of the animal powers, the improvement of the secretions, to the regulation of the regimen and habits of the patient, will conduce far more to the removal of the local symptoms than any measures apparently of more direct or special application. Abundant illustration of these remarks will be found in connection with the treatment of the organic form, as well as in the details of the reported cases at the end of this chapter.

2. INFLAMMATORY STRICTURE.

It has been necessary in some measure to anticipate in a preceding section remarks which would otherwise have appeared under this head, illustrative of INFLAMMATORY STRICTURE.

It will be recollected that inflammation was noted as one of the principal causes of spasm, and the symptoms and progress of a case described, in which, as is not uncommon, the two conditions acting in concert occasioned retention of urine, a case which, in consequence, may be regarded as equally typical of the inflammatory constriction, but which it was deemed best to detail in connection with the subject then considered.

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* "Observations on the Diseases of the Urethra," &c., by Sir B. C. Brodie.

Under the appellation of inflammatory stricture will now be considered the existence of such a condition in the vessels of the urethral mucous and sub-mucous tissues, when it is capable of producing marked narrowing of the canal.

Nothing is more familiarly or better known than the swelling which accompanies inflammation in a part, arising primarily from distension of the capillaries themselves, which form so large a proportion of all soft tissues; and secondarily, from exudation of some kind which varies in quality according to the nature, degree, and persistency of the inflammatory process. This is so constant a phenomenon as to be reckoned among the pathognomonic signs of inflammation. Accordingly, when the mucous membrane of the urethra is the seat of acute inflammation, it becomes tumid, and the calibre of the canal is narrowed to some extent. In ordinary attacks, however, although the stream of urine is on this account a little smaller than in health, the alteration is not the most prominent symptom, and therefore attracts little notice on the part of the patient; moreover, it usually disappears with the subsidence of the acute symptoms. But if by the application of too irritating injections applied in the early stage, the force of the inflammation is augmented; or if by any mode of treatment, as it has appeared to myself in several instances, a profuse discharge, which has persisted after the acute stage has passed, be suddenly stopped, the affection is prone to extend more deeply; exudation takes place into the sub-mucous tissue at some point, usually throughout a considerable portion of the course of the canal, and stricture of a temporary kind and inflammatory in its character is the result. It appears that when a sudden check is given to such discharges, through the means of some powerful astringent perhaps, acting locally on the relaxed surface, the vessels beneath, being still unaffected, pour out into the interstitial tissue a part of their contents in the form of an albuminous solution, or it may be one containing fibrin also. In this condition nothing is easier than to lay the foundation for a permanent contraction; the incautious use of instruments, or neglect to reduce the inflammation completely, arising not unfrequently from some indiscretion or impatience on the part of the patient, will assuredly promote such a consummation.

The distressing pain which accompanies these attacks, marks the nature of their cause. Mere spasmodic closure of the canal *may* at first be attended with no pain, the patient not suspecting his inability to micturate until the attempt to do so is made. But when inflammation is the chief agent in producing retention in the manner described, a considerable amount of suffering precedes it. There are present unusual heat, sense of fulness and tenderness of the perineum ; the stream of urine is at first gradually narrowed, and so painful is its passage to the exquisitely sensitive urethra, that the patient is wont to compare it to that of "boiling water or melted lead" trickling through it. It is then ejected in small and short jets with great force, at gradually lessening intervals, until the straining becomes almost constant, and it soon ceases to pass at all. It will be unnecessary again to enumerate the varieties of inflammation in the urethra. That which most frequently gives rise to the inflammatory stricture is the gonorrhœal. We have seen how irritating injections during the acute stage, and sudden repression of the discharge, after that has passed over, may cause it. Exposure to wet and cold weather, and drink often taken to fortify the system under such circumstances, "*to keep out the cold*," as it is termed, give rise to the condition. (See Cases 1 and 2.) I have traced it also to sitting on a cold stone, or upon wet ground, for some length of time. Case No. 3, forms an excellent illustration of these remarks.

Much influence has been attributed by some writers to the mere introduction of a sound in the production of a congested condition of the urethral mucous membrane, sufficient to narrow, if not occlude, the canal; and cases which may be referred without hesitation to action of the involuntary fibres so excited, have been in this manner accounted for. The erectile tissue of the penis has been usually held to possess a similar power, and constrictions at any point, excepting that which the voluntary muscles of the membranous part encircle, have been explained by reference to its action. This, however, is a theory wholly unsupported by our knowledge of the anatomical character and physiological actions of the mechanism which produces erection. Admitting that the dilatability of the urethra is greatly diminished during the persistence of that state, a fact which is sufficiently obvious, the narrowing must be *general*, that is, pervading equally every part of the canal which is surrounded by that peculiar structure. It is not physically possible, from the perfect continuity of passage which belongs to its vascular tissue, that one portion can be rendered turgescent, while that which is adjacent continues in the opposite condition. Hence the notion that this action can become the cause of a constriction which is limited to a portion only of the canal must be utterly repudiated. I have before stated at length what may be regarded as the true explanation of the mechanism by which the urethra is enabled to hold with a firm grasp a sound or other instrument introduced within it.

We meet with some individuals who, suffering more or less from contraction of the canal, possess also a great disposition to hæmorrhage on the smallest instrumental interference with it. However carefully a sound be passed in such cases, some bleeding ensues, or one learns at the following visit that a few drachms were lost an hour or two afterwards. In such instances we may suspect the existence of an unusually congested, or unduly vascular, state of the mucous membrane, and which has assumed a more or less chronic character. For such, the nitrate of silver may sometimes prove a useful application, when applied in solution or otherwise; the result of treatment renders the correctness of the suggestion still more probable, the narrowing and the hæmorrhagic tendency sometimes disappearing, "*pari passu*," under its influence. Very rare are the opportunities afforded for the examination after death of the parts in these cases, and therefore exact statements cannot be made respecting them. Wanting these for the present, it is not an improbable conjecture that a congested, perhaps a varicose condition of the vessels of the mucous membrane, has formed the chief mechanical obstruction in many of them, and this, it is not unlikely to suppose, might elude detection altogether at a post-mortem-examination, having in fact ceased to exist at death.

This opinion has the support of Leroy D'Etiolles. He even goes so far as to make a separate class of "turgescent or erectile strictures." I have before shown on what grounds the existence of erectile stricture must be regarded as extremely doubtful, and some of the cases which he attributes to this erectile turgescence, I have no hesitation in believing were due to spasm of the involuntary muscular fibres. Those in which we are to recognise the existence of turgescence must be instances of habitual varicosity in the capillaries of the part, and not of mere transient injection arising from the application of an excitant to it, even if it could be admitted that the latter state were capable of giving rise to phenomena worthy of the name of stricture.

Again, the writer above quoted describes another and a separate class of strictures, viz., the varicose. Morgagni also states that "certain places of the urethra are narrowed by turgid and varicose blood-vessels." Civiale, on the other hand, absolutely denies their existence.

I shrink, however, from recognising these distinctions as of sufficient importance to interfere with the classification adopted here. *First,* because although the terms employed assume to give a precise anatomical description of the existing morbid condition, the knowledge of its existence is derived from phenomena presented by the *living* body, in which it (the condition) cannot be observed, and they are therefore not supported in any way by an observation of anatomical appearances; and, *secondly,* because I am not convinced of the utility of such refinements, but, on the contrary, conceive that they tend to make the subject undesirably complex, besides perhaps affording a pretext for the assumption of pretensions to the possession of unusual discrimination in practice, which, if not well founded, are always highly mischievous and discreditable.

As inflammatory stricture first comes beneath the surgeon's notice under the aspect of urinary retention, I shall postpone the question of treatment for the present, and hereafter devote a chapter to the consideration of that condition, and of the measures to be employed for its relief.

CASE I.

Slight organic stricture of some standing—A recent attack of gonorrhœa—Inflammation aggravated by the use of stimulants, &c., causing retention.

M. P., æt 27.—Admitted to University College Hospital, May 23, 1846, with retention of urine at 2 A.M. A night cabman, much exposed to cold and wet. Is accustomed to drink a good deal, and irregularly.

Five years ago had gonorrhœa, which he thinks was never altogether cured. Has had more or less difficulty in passing water for a long time; cannot say how long. Has a purulent discharge from the urethra now, which he acquired nearly a month ago, and it continues as profuse as ever, with much scalding in micturition. Since yesterday morning has passed no water. Complains of severe pain about the pubes and in loins; aggravated during the violent efforts to pass water which he makes from time to time, although without success. The penis and scrotum are hot and swollen, and the vessels of both are turgid. Ordered a hot bath immediately; an opiate enema and an active purge. Much relieved by the bath, and passed water freely in it, after he had remained there nearly half an hour. In the evening he passed water again, but in a small stream, and with much scalding. Ten leeches were applied to the perineum, they acted well, and afforded additional relief.

During the next three or four days, the bowels having been kept freely open, the stream of urine increased in size. To continue in bed and on low diet for the present.

In the course of a week the use of the catheter was commenced, and was regularly employed at intervals afterwards, and he was discharged in the middle of June. No. 10 passing easily.

REMARKS.—Such cases are almost of daily occurrence, and the foregoing history is intended to illustrate them. Some degree of organic stricture existing, inflammatory congestion, caused by stimulating liquors and external cold, closes the passage altogether. Generally, a catheter may be passed with care and gentleness; but in this case, as there was extreme turgescence of the parts and profuse discharge, the hot bath was first used, and, as it proved, successfully, followed by antiphlogistic treatment. The temperature of the bath should be from 102° to 106°, or more. Some patients who are accustomed to the remedy, find no relief until a very high temperature is reached. It is an invaluable agent in these cases, diverting the blood to the surface, and so tending to unload the congested vessels of the internal parts, while it subdues involuntary strainings, and relaxes muscular fibre, which objects, as well as the action of the skin, are promoted also by the opiate enema. The dilatation of the permanent stricture is, of course, to be postponed until the inflammation has subsided, and the urethra is in a less irritable condition.

CASE II.

Very slight, if any, organic narrowing—Retention from cold and drinking, probably due chiefly to congestion of the urethra, and some spasm.

J. G. æt. 36.—A coachman. Habits somewhat irregular; drives much at night during the London season, and is thus frequently exposed to the weather.

1857. May 19.—Applied at University College Hospital, suffering severely from retention of urine, which had lasted since yesterday afternoon. He was on the box for some hours last night, insufficiently clothed, and several times took "a dram," to keep himself warm. He was unable to relieve his bladder, except of very small quantities. During the night he used fomentations freely, but got no relief, and early in the morning went to a medical man in the neighbourhood, who made persevering efforts with several catheters, but without success. He had a warm bath, and passed a few drops there, but nothing more. A good deal of blood had resulted from the catheterism. The medical man sent him to me at the Hospital, at the time of my visit. There had been no gonorrhœal discharge for many months. Tongue coated and feverish.

With care, and after a little difficulty, I passed No. 3 into the bladder, withdrawing thirty-eight ounces of urine. Ordered a brisk purge, and rest for a short time.

During the next few days, his stream of urine improved, without catheterism; and in a fortnight's time, not before, I introduced a catheter for him—No. 9, and it passed into the bladder without difficulty. I thought it right to use instruments again a few times, until No. 12 passed.

Remarks.—Whatever the degree of organic contraction, which must have been extremely slight, there can be little doubt that the main element in this case was congestive or inflammatory obstruction. Such instances are excessively common, and this brief history is recorded as a type of them.

Very simple treatment after the retention has been relieved is generally sufficient; and the application of instruments should, as a rule, not be commenced until the inflammatory symptoms have fully subsided, unless any fresh access of retention has occurred to render mechanical interference necessary.

Probably, a thoroughly hot bath *before* the first employment of the catheter, might have sufficed here, as in the preceding case; but catheterism, when unsuccessful, generally aggravates the condition of the patient, and renders him less susceptible of relief by constitutional means.

Case III.

A recent attack of gonorrhœa, subsiding—Exposure to cold—Inflammatory stricture and retention.

C. T. B., æt. 26.—A tall, well-proportioned young man, complexion florid; healthy-looking. I received an urgent message to see him at 11 P.M., June 15, 1852. I found him seated on the edge of his bed, bending forwards to relieve the agony he was suffering in the loins and hypogastric region; he was bathed in perspiration, straining violently to relieve his bladder, but unable to pass a drop of urine. Pulse full, 110. Learning a few particulars at the time, and others subsequently, the following history was obtained. He had been actively engaged at cricket with some friends during the day, and had made considerable exertions. He perspired freely, and had drunk, but not immoderately, of weak gin-and-water to quench his thirst. Afterwards, in the cool of the evening, he sat down with others to rest and cool himself upon the grass, which was very damp, and took no precautions to avoid it. Feeling chilly, he walked home quickly, where he passed water, but not freely, and with some smarting. Half an hour afterwards he shivered two or three times, and fearing he might have taken cold, was persuaded to drink a glass of hot brandy-and-water, and to go to bed. Not long after he found himself unable to relieve his bladder, although he made considerable efforts to do so, a little urine being ejected with force at intervals, but soon even this did not pass.

Three weeks before, he had contracted a gonorrhœa (the third attack), and the discharge had recently subsided under the use of injections, and the present was the first occasion on which severe exercise had been taken since. A No. 5 silver catheter was at once introduced. It passed slowly, from the extremely tumid condition of the urethra, and, although used with the greatest gentleness, gave considerable pain. At about five or six inches from the meatus its progress was stopped. Cautious manipulation was employed for about five minutes, but unsuccessfully, and it was then withdrawn. The means being at hand, orders were given to prepare a hot bath as soon as possible. In the meantime, a smart purge of calomel and jalap was given, an enema administered, containing about forty minims of tincture of opium, and a dozen leeches were instantly applied to the perineum. A saline aperient and antimonial mixture to be taken frequently. The opium materially allayed the violent straining, and in an hour's time, when the bath was ready, he was much quieter, but still no urine had passed. He was placed in this at a temperature of 104°, and most of the leeches having dropped off, he bled freely in it. In twenty minutes, no urine having passed, a No. 3 catheter was introduced and carried onwards very slowly and carefully, the patient being still in the bath, until in about two or three minutes it passed into the bladder. He was raised, and about fifty ounces of urine were drawn off, when the catheter was instantly removed, and the patient placed in bed. The relief afforded was, of course, immediate, and, to use his own words, "wholly indescribable." In less than a quarter of an hour he was soundly asleep. After two hours he awoke, when the bowels were freely opened, and a stream of water of moderate size passed at the time, although accompanied by considerable smarting. There afterwards appeared a slight disposition to permanent contraction about the bulb.

REMARKS.—This case is a good illustration of inflammatory stricture. Predisposition to such an attack existed in the inflammation of the urethra which had recently occurred, and which, indeed, had not yet undergone complete resolution. The exciting cause was a rapid check to the cutaneous circulation, combined with the direct application of cold and damp to the perineum, which tended to produce extraordinary congestion of the mucous membrane and submucous tissues of the urethra, so as to occlude the canal. It is worthy of remark that the treatment in such cases must necessarily be regulated somewhat according to circumstances. Thus, the catheter is first to be employed, and is generally successful. If it does not pass freely and readily no violence is to be used, but other means are to be employed before resorting to it again. Nothing is easier than to do mischief, and lay the foundation of permanent stricture in these circumstances. Again, abstraction of blood by cupping is generally better than by leeches, if a good operator is within reach. A hot bath for the *whole* body is most desirable as soon as it can be obtained; if not, hot fomentations should be diligently applied to the hypogastric and perineal regions. The medicinal means are generally procurable, and their use requires no comment here.

CASE IV.

The lithic acid diathesis—Urethral irritation—Slight degree of organic contraction occasioned—The importance of constitutional treatment exhibited.

A. J., æt. 53.—Applied to me, April 29, 1850. A merchant; married; conformation stout, inclining to plethoric; complexion florid; habits domestic, regular, and generally conducive to health; has never indulged to excess in the use of alcoholic liquors, but ordinarily partakes freely of nutritious and a somewhat stimulant diet; has been accustomed to considerable bodily and mental exertion in connection with business, and is prone to be very anxious at times; has become stouter of late years, and has taken less bodily exercise than formerly; never had any severe disease, except "inflammation of the lungs" more than twenty years ago, after exposure to cold; never had gonorrhœa, or any disease of the genito-urinary organs, that he is aware of; has twice observed a few small vesicles about the prepuce, which have disappeared in a day or two, evidently herpetic; he very frequently has a similar eruption about the lips, and then usually takes with benefit a seidlitz powder or two; his stomach is frequently out of order, and he has had several slight attacks of indigestion during the last few years; has two or three times had advice on this account, and been relieved by the regulation of his diet, and by medicine; but, on feeling better, the strict regimen has been relaxed, and he has experienced his old symptoms again; he often suffers from flatulence, acidity, and heartburn. Certain new symptoms, however, have lately appeared, which are the cause of his present application. He states that *about six years ago* he first noticed some heat and smarting during micturition, more particularly on first rising in the morning. It was inconsiderable, and he did not then pay much attention to it, but after it had continued for a few days, although varying in degree, he paid attention to the appearance of the urine itself, which looked darker, and deposited a red sediment, which he supposed to be gravel. The weather had been windy, dry, and cold at this time. It soon disappeared, and, enjoying his accustomed health, he thought no more of it. A week or ten days ago the same symptoms reappeared. He says that the urine frequently passes now in so small a stream, that in the morning when rising he is often obliged "to place the vessel on a chair," owing to the length of time required to empty the bladder, and that he strains in order to hasten it, but without making much difference. At other times the stream is larger, but certainly at no time now is it so full as it used to be; the want, also, to make water occurs twice as frequently as before during the day, although he is not required to rise at night. On examining the penis, the lips of the meatus externus appear to be red, a little puffy, and slightly glued together, as if by increase of viscidity in the natural mucus of the passage. Pressure along the line of the urethra gave a little smarting pain; none in the region of the prostate. No attempt was made to introduce an instrument. The skin is dry, and a little scaly about the face, and inclined to crack on the lips. He attributes this to the sharp east wind which has prevailed of late. Tongue nearly natural, little reddish and furred at the centre; appetite moderate; bowels rather costive. Ordered a light nutritious diet; no malt liquor; two glasses of sherry to be taken with soda-water at and after dinner, and no other alcoholic liquor; to sponge the whole body with tepid water every morning, using friction after, and to take a bath at 96° every third or fourth evening, before going to bed; to take the following pill every night:—℞. Pil. hydrarg., ext. hyoscyami, āā, gr. ij., pulv. ipec. gr. ½, ft. pil. ℞. Pulv. magnesiæ calc., pulv. guaiaci āā gr. x. ft. pulvis om. primo mane ex aquæ cyatho sumenda. ℞. Sodæ sescarb. gr. xv., tinct. hyos. ʒss, tinct. humuli ʒj., decoct. pareiræ ad ℥jss, pro haust. ter in die sumenda. The urine passed early in the morning, was sent for examination, the result of which was as follows:—Sp. gr. 1024, clear, rather high-coloured; obvious precipitate of cayenne pepper crystals of uric acid; a thin layer of flocculent deposit resting upon them; no albumen; under microscope, an abundance of conglomerated yellow crystals of uric acid, several blood discs, some exudation or granular corpuscles, and epithelium. The plan laid down was perseveringly adopted, and in about a week or ten days the patient's condition had decidedly improved. There was less irritability about the mucous membranes altogether, but little smarting in micturition, which was scarcely more frequent than natural, and the stream of water was certainly larger. He was very anxious now that an instrument should be passed into the bladder, having great dread of some organic obstruction in the passage. This had been refused at the first visit, although he had then urged it; however, there was no objection this time, and accordingly No. 8 silver catheter was passed with ease, and some healthy-looking urine drawn off. No particular pain was occasioned. To take the pill every other night. In all other respects to continue the same. In another week the urinary symptoms disappeared, and the general health was much better than it had been for months. To continue regimen and diet, discontinue the other medicines, and have a mixture of alkali and bitters. Soon after this he was lost sight of. Late in the autumn twelve months following, a recurrence of the symptoms brought him under treatment again. The weather was cold and damp, and he had been dining out frequently. A somewhat similar plan of treatment was equally successful this time. After the urethral irritation had subsided, I considered it desirable to introduce a sound until Nos. 10 and 11 passed easily, which they did not do at first.

REMARKS.—The best comments on this case will be found at pp. 132–3. It is here recorded for the purpose of illustrating a class of cases there described, which it is highly important to recognise as of constitutional and not of local origin. Catheterism in the first instance would certainly have aggravated a malady which general treatment, and strict attention to diet, &c., could alone remove. The local condition was undoubtedly one of some irritation and congestion of the urethra and bladder, producing constriction of the canal, at the same time favouring the occurrence of muscular contractions of the parietes, excited by unduly acid urine. After this had been subdued, there was no objection to sounding the canal. On the second application there seemed to be some permanent tumefaction of the mucous membrane. This state may be properly treated by sounds, but not until the functions of the skin and other organs have been corrected. Local irritability then subsides under their employment. This case is illustrative of the earliest symptoms by which the commencement of an organic contraction of the urethra may sometimes be manifested in elderly people, where it is wholly unconnected with any previous specific inflammation of the urethra. Such symptoms, neglected at the outset—and especially if treated by much instrumental interference—may, in the course of time, lead to confirmed stricture, as well as to the formation of calculus in the bladder, on which account I have thought it desirable to give the foregoing detailed report.

CHAPTER VI.

THE DIAGNOSIS AND TREATMENT OF STRICTURE OF THE URETHRA—DILATATION.

Diagnosis of permanent stricture—Instruments used in exploring the urethra—The curve to be selected—Instructions usually given for passing the catheter—Curve recommended by Sir Charles Bell—Difference between catheters and sounds—Relation between the axes of the shaft and point—The handle of a catheter—The eyes—The method of introducing a catheter—The "tour de maitre"—Slight obstruction not necessarily organic stricture—Obstruction occasionally encountered at the neck of the bladder—Instruments adapted for diagnosis—Bulbous sounds—Treatment—Objects of—Various modes necessary—All may be comprised under three heads, viz. Dilatation, Chemical Agency, and Incisions—Instruments—Dilatation—History of—Applied to a simple case—Prognosis—The method to be followed—Medical and dietetic treatment—Over distension—The employment of dilatation in order to be successful must be steadily pursued—A case of greater difficulty—The degree of force to be employed—The question of "force" in the employment of dilatation — Mode of dealing with obstinate stricture—Injecting oil—Probe-pointed catheter—Orifice of stricture not in the axis of the urethra—"Twisted bougies"—Sources of difficulty behind the stricture—The relative merits of flexible and inflexible instruments—"Model bougies"—Method of Dupuytren, or "Vital dilatation"—Method of retaining a catheter—"Continuous" or "permanent" dilatation—Occasional results of—General results of—The kind of catheter to be employed—Mr. Wakley's instruments—Effects of too forcible dilatation—Dr. Buchanan's compound catheter—Maisonneuve's method—Dr. Hutton's—Dr. Arnott's instruments—Perrève's—Mr. Holt's—His method by rupture—Rapid dilatation—Conical sounds—Use of chloroform—Belladonna—Advantages to be derived from rest and regimen—Importance of examining urine—Tests—Indications for treatment—Rationale of dilatation—Dilatation generally, but not invariably, successful.

THE SYMPTOMS of stricture, however well marked in any case, will not afford us all the information respecting it which it is necessary to possess in order to enter upon the treatment at once. The diagnosis must be conclusively established; it is necessary to investigate the state of the urethra, to ascertain whether a permanent obstruction exists, and, if so, at what part of the canal; what is the nature of the obstacle as far as it can be learned by instrumental contact; whether it consists of one contraction only or of several; whether it involves a small or a large portion of the canal.

This object is to be accomplished by the passage of an instrument along the urethra, for the management of which some general directions may be appropriately given in this place.

In order to explore the canal in the case of a patient presenting himself with the history and symptoms of stricture, instruments of various forms and compositions may be used. Some are soft and pliable, others elastic, others inflexible and solid. As a rule, to which there are undoubtedly exceptions, the latter description is to be preferred; first, because there need be no doubt or hesitation as to the exact direction and situation which the point of the instrument takes in its passage, seeing that it is incapable of becoming bent or altered in form by any obstacle it may encounter; secondly, because the movements which the point makes can be exactly controlled and determined by the hand which holds the opposite end of the instrument, and whatever force it may be necessary to make with it can be applied in any predetermined direction, which cannot be the case with a flexible sound; thirdly, because the curve, which is one of the most important elements of an instrument, is almost certain to be altered by manipulation in the urethra, if the instrument be not solid, or at all events inflexible. For my own part I prefer a solid silver sound, or, which is much cheaper and almost equally useful, a well-polished steel one, silver-plated, the chief advantage of the former material being, that it permits slight alteration to be made in its form for special cases without sustaining injury.

CURVED INSTRUMENTS.—As a rule surgeons almost invariably prefer curved to straight instruments, for use in the urethra. But at the same time it is true that curves differing from each other widely, in value and character, are used by equally-practised operators.

Further, it is admitted, that whether it be great or small, that which the surgeon has been most accustomed to, will be the best and the most efficient in his hands. So much does habit influence the practice, it has been said, that the form of an instrument is a matter of little moment. With this opinion I must however, to some extent, disagree. If certain good reasons for the contrary did not exist, an instrument might as well be straight, and not curved at all. But if a curve be necessary, surely it is well worth an attempt to discover what is the most efficient and valuable one for general use. Were it necessary to construct a sound or catheter upon *à priori* principles, we should naturally, as it appears to me, adapt its curve to that of the least movable portion of the urethra itself. In the anatomical part of the work, this was shown to be equal to a portion of the circumferential line, equal to about three-tenths, of a circle three inches and a quarter in diameter. Now as we shall see that the instrument must, in its transit to the bladder, through a *healthy* urethra, describe a curve, and turn round an axis, which may be imagined to exist about the centre of the symphysis pubis, it follows that it will most easily do this, if its own curve corresponds with that described. Accordingly this principle may be safely recommended as that on which the plan of its construction should be based.

Next as regards the testimony of experience, without corroboration from which the theory will be vain and worthless, I must confess that having tried many forms for a long period, I have, on the ground of practice, adopted and advocated the use of a similar one, and this at a period antecedent to the prosecution of any special and direct researches into the character of the urethral curve, simply from having found such a form the most successful for the majority of cases.

The principle will be readily understood by a reference to Fig. 7, *a*, which represents part of a circle, three inches and a quarter in diameter; an arc of which, whose chord is about two inches and three quarters, represents the sub-pubic curvature of the urethra in its natural condition. Applied to it are two instruments—*a*, a catheter, and *b*, a sound, which consequently possess the direction required; and it will be seen that these instruments are more curved, that is, they describe arcs of a smaller circle than those which are usually employed: I say usually, because some surgeons there are who do habitually adopt this form.

Let us for a moment advert to the ordinary instructions which are given by lecturers and authors, respecting the passage of the male catheter. It will be unnecessary to make quotations, but the cardinal points are commonly presented to the student somewhat after the following manner:—"It is desirable that you should keep the point of the instrument along the upper surface of the urethra; the obstacles presented there, in the form of lacunæ, &c., are fewer in number: you will also thus more easily get through the narrow point, at the junction of the bulb with the membranous portion. If you do meet with any difficulties at this spot, withdraw the point of your instru-

FIG. 7.

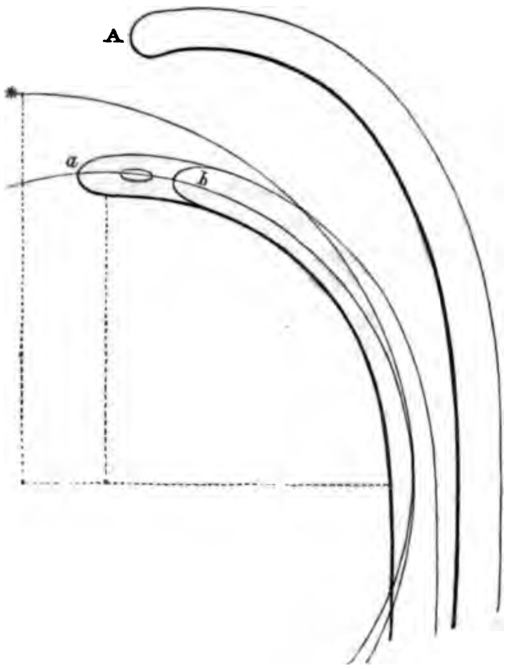


FIG. 7.—Curved line forming an arc of a circle, three inches and a quarter in diameter.

a, a catheter, and *b*, a sound applied to it.

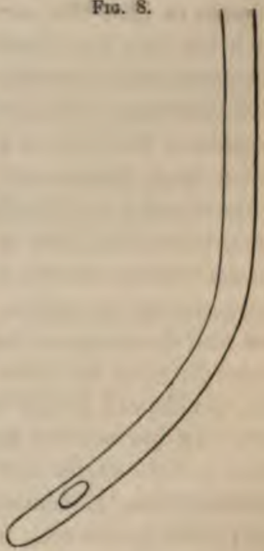
* Curved line forming an arc of a circle four inches in diameter.

A, from Sir Charles Bell: "the proper curve given to the point of a bougie, in order to avoid the natural obstructions."—*Morbid Anatomy of the Urethra.*

ment a little, and then pass forwards again, elevating it rather more, as probably it was obstructed by the depression at the sinus of the bulb, and consequent entanglement against the perineal fascia. Farther on, if you wish to avoid the verumontanum, the prostatic sinuses, above all any enlargement of the gland itself at the entrance to the bladder, or any band across there, which not very unfrequently exists, let your manœuvres be so directed as to keep the point still against the upper surface."

All this is very sound advice, and naturally enough applies to the use of an instrument, of which the curve is so much larger than that of the passage it is designed to traverse, that its point must invariably have a tendency to come into contact with the floor of the canal, so that management is required in order to avoid an encounter with the obstructions there. The curves of the instruments which are usually found at the makers, describe, as nearly as possible, arcs of circles varying from four to four inches and a half in diameter, which arcs comprise rather less than one-fourth of the circumference. And sometimes, which is worse, the last inch of the sound is scarcely flexed at all, but forms a straight line at the end of the curve, as represented in Fig. 8; a form which a moment's consideration will show to be wholly unfitted to traverse the urethra with ease and safety. The direction which such instruments must tend to take will be best understood by a reference to Fig. 7, *, which represents part of the larger circle of four inches diameter.

FIG. 8.



It was doubtless the influence of similar convictions that led Sir Charles Bell, in his engravings of the morbid anatomy of the urethra, to figure a catheter much more curved than the instrument then in use, as the form which he considered to exhibit "the proper curve given to the point of a bougie in order to avoid the natural obstruction" arising from the deep perineal fascia and prostate when, in their normal or healthy state. His instrument very much resembles that which is here recommended. See Sir Charles Bell's work, Plate II., Fig. 3; also Fig. 7, A, in this work, to which his drawing has been transferred.

But all the obstacles in question will be most safely and easily avoided by adopting an instrument so formed, that its point will traverse the urethra without necessarily exhibiting a tendency to incline more closely to one aspect than to another; and those of my younger brethren, who have not yet acquired a dexterity associated with the use of any particular form, I should strongly advise to adopt one which, on the ground of reason as well as from my own experience, I have felt bound especially to recommend. At the same time let me not be understood as speaking equally and indiscriminately of catheters and sounds. The former instrument is intended to pass into the bladder, and consequently must traverse the whole course of the urethra. It should therefore be rather longer than the latter instrument, which is employed chiefly in the reduction of strictures in the course of the canal. Thus, while the curves of both should represent arcs of the same circle, this should form one bounded by a shorter chord than the curve possessed by that. In other words, the curved portion of the sound should be shorter than that of the catheter, although both be constructed upon the same circle. Indeed, a sound should be a shorter instrument altogether; such an one is managed with more ease and certainty, when applied to an obstruction, than is the longer instrument. See Figs. 7 and 9. Thus also when catheters are employed in the treatment of stricture, it is undesirable to have the curve prolonged quite to the extent of that which has just been described. It is advantageous to shorten the instrument at its point about the fourth or the third of an inch.

The direction of the point of an instrument, in its relation to the direction of the shaft, is a matter of importance in the construction. Unless some known and constant relation exists, it is impossible for the operator to be perfectly cognisant of the line in which pressure is made when force is applied to the handle. But it is of the greatest consequence in the act of opposing an instrument to an obstruction in the urethra, not only to possess a familiar acquaintance with the course of the canal itself, but also a knowledge of the precise direction which the point of the instrument must necessarily take, as indicated by and inferred from the position of the handle or shaft. In the catheter first described, the direction of the point is always at right angles with the axis of the shaft. Consequently it is exceedingly easy to maintain a constant view of its progress and bearings (in the mind's eye), however deeply buried the instrument may be, by remembering this relation. Thus when the shaft is in the horizontal position, it is known that the point must assume the perpendicular. When the shaft forms an angle of 45° with the horizon, the point is directed in a line which forms an angle of exactly equal value, and so forth.

All instruments should be so constructed as to exhibit a certain easily-determined relationship between the axes of their shafts and points. The solid sound may vary as before described; the axis of its point, instead of forming a right angle with the shaft, may subtend one which is more obtuse, say by 20° or 30° (Fig. 9). So, again, in a catheter which requires to be more curved than that delineated, as in the catheter for enlarged prostate, the same relationship may nevertheless still be advantageously maintained between the axes of the point and shaft, by curving backwards the latter just so many degrees as the point incurves, the direction of which is thus at once indicated by the line assumed by the handle.

Fig 9.

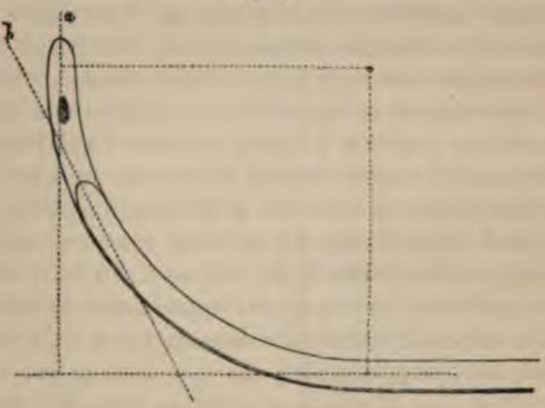


Fig. 9.—*a*. An instrument (a catheter) in which the axis of the point forms an angle of 90°, or a right angle, with the axis of the shaft.
b. An instrument (a sound) in which the axis of the point forms an angle of 120° with the axis of the shaft, or a right angle and the third of a right angle.

By adhering to this principle in the construction of these urethral instruments, much more certainty may be attained in their employment. It is almost unnecessary to state that these principles are not recognised in the construction of the catheters which are ordinarily made, and that it is only by paying especial attention to the direction of the two axes of the shaft and point respectively, that it is possible to predicate with unerring certainty, the direction which the extremity of an instrument takes, while it is hidden in the urethra or bladder.

Something remains to be said about the handle of an instrument. Solid sounds have generally flat, expanded, and somewhat roughened handles of wood or ivory, which are convenient as affording a firm hold to the operator, and as indicating exactly the lateral direction of the instrument, so that it cannot twist or turn in any degree, without the deviation being perfectly manifest. A ring on each side, provided it be oval and sufficiently large, answers the purpose equally well, or nearly so. It has been objected by some that it is undesirable to supply the means of holding an instrument very firmly, since the power of the operator is increased thereby, and the employment of force is confessedly so dangerous. To this I reply that the precision thus afforded admits of its being used with a far lighter grasp, and so enables more delicate sensations to become appreciable to the finger, certainly rendering the employment of force less necessary than when these advantages are not enjoyed. Again, it by no means follows that the possession of power implies its use, much less its abuse. The formation of the eyes, or openings through which the urine passes, also involves a matter of some importance. If too large, they certainly help to obstruct the passage of a catheter, from the mucous membrane of the canal protruding into them, which affords a ground of preference for the solid sound, when withdrawal of the urine from the bladder is not indicated. A small opening on each side is sufficient, bearing a relative proportion in size to that of the catheter, but which might advantageously be a little smaller than those which are generally made: one should be placed at the distance of half an inch, the other at one inch, from the extremity, and the edges should be neatly and smoothly bevelled.

INTRODUCTION OF THE CATHETER.—It is exceedingly desirable to follow a uniform plan; such a practice leads sooner to perfection in the art, than can be attained when indifference to method exists. First, as to the position of the patient. It is usual in most cases to place him with his back against the wall. Some operators, in their own consulting rooms, have a couple of arms or elbows, like those of an arm-chair, fitted into the wall at a convenient height, for the patient's hands to rest upon. These answer the double purpose of keeping him steady in one place and of affording an agreeable support. The heels should be eight or ten inches apart, and about four or five inches from the wall, so that the nates rest lightly against it behind, the toes turned a little outwards; in this manner a relaxed condition of the parts is favoured. The patient should unfasten his waistcoat and braces, so that the trowsers can be lowered; mere opening of the dress is insufficient. An appropriate instrument having been selected, it should be warmed, either by immersion in

FIG. 10.

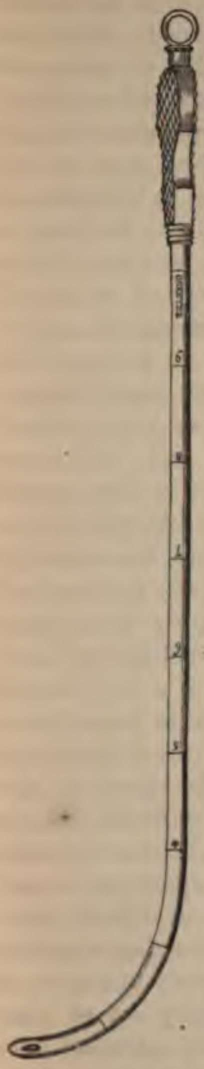
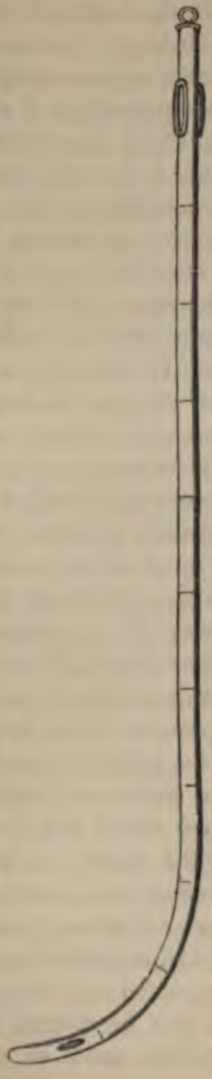


FIG. 11.



hot water, by friction with a cloth, or by placing it for a few minutes up the sleeve in contact with the arm, and afterwards it should be smeared with oil or lard. In introducing it, the handle should be lightly held between the thumb and the fore and middle fingers of the right hand, the concavity of the curve looking towards the left groin of the patient, and the general direction of the instrument being almost horizontal. The penis is now to be gently raised with the left hand, while the point of the instrument is inserted into the urethra and slowly carried onwards until four or five inches have disappeared, the handle being gradually brought to the middle line at the same time, and maintained close to the patient's abdomen until it has reached the perpendicular, when it is to be lightly depressed; and as the point is felt to traverse

FIG. 10.—A catheter; curve formed on a circle three inches and a quarter diameter; direction of point at right angles with direction of shaft. The drawing is carefully made on a scale of half the actual size, from an instrument constructed by Mr. Coxeter, of Grafton Street, Tottenham Court Road, on the principles thus explained.

FIG. 11.—A similar catheter, with large oval rings instead of a wooden handle.

the sub-pubic curve, the handle is gradually brought down towards the operator, until it sinks beneath the horizontal line, when the opposite extremity will be free in the bladder. The more quietly, gently, and unostentatiously these manipulations are accomplished, the more credit will the operator obtain for the possession of a light and easy hand; a credit, let it be remarked, which is generally appreciated by the patient. Whatever obstruction is met with, no force is to be used at first. If any difficulty is encountered, it is not to be announced to the patient by any alteration of manner, by any boggling or poking with the sound; his attention is rather to be adroitly disengaged from the operation by some irrelevant question or remark, while the penis is gently drawn forwards on the instrument, and the direction of the latter varied. If difficulty occurs in the act of depressing the handle, just after this has reached the perpendicular, it very probably arises (supposing no organic constriction to exist), from making this alteration in its course too soon, and if the instrument be replaced in the perpendicular position and pushed onwards a little farther, before depression is made, very likely all will be right. If a solid sound of good size be used, and the urethra be healthy, its own weight is almost sufficient to carry it through the canal; or at all events a very slight pressure from the fore-finger upon its handle will be amply sufficient, if additional impetus be required. It is never to be forgotten that a lever of a very powerful kind is in action when depression of the handle is made, the extremity of which lever is in the operator's hand; the fulcrum at the convexity of the curve, the resistance being the structures upon which its point impinges, and which may be perforated if undue force be applied. Whatever the obstruction it is never to be carried by storm. A patient, persevering, and unruffled spirit, with a light and dextrous hand, will work miracles in cases of difficult catheterism. All attempts at display, at brilliant manœuvring, at rapidity of execution, to dazzle the eyes and gain the applause of lookers-on, if such be present, should ever be deemed wholly out of place, fraught with danger to the patient, and if so, surely calculated to redound, at some time or another, to the discredit of the operator.

That mode of passing a catheter which has obtained the term of the "tour de maitre," is on these grounds somewhat objectionable. It consists in introducing the instrument with the convexity of its curve upwards, and with the handle in a perpendicular line beneath;

in carrying it to the deep perineal fascia in this direction, and when it has arrived at that point, in sweeping it round so as rapidly and adroitly to describe a half circle, of which its point is the axis; at the same time gradually depressing the handle to carry the instrument through the sub-pubic curve. It is the same operation as that before described, but more rapidly performed, and commencing with a long sweep from below. The only difference I have been enabled to discover is, that it gives more pain to the patient, and creates more alarm in his mind, than the simpler but less showy operation which has been before recommended.

But, for the majority of cases, I prefer to place the patient in a recumbent position. Both patient and operator thus occupy positions of less constraint, a matter of importance if much time is to be expended. In some instances indeed it is almost necessary; for example, when he exhibits a tendency to faint, or when he is confined to bed. The head and shoulders should be slightly elevated by pillows, the knees a little raised and separated from each other; in this manner a relaxed condition of the muscles of the abdomen and perineum is favoured. The operator should then stand on the left side of the couch or bed, hold the catheter as before directed, introducing it over the patient's left groin, the handle being in the horizontal direction; he should support the penis with the left hand, holding it lightly either between the thumb on one side, and fore and middle finger on the other, or in the following manner, which is systematically practised and recommended by Civiale: The left hand is in this case applied, the palm being upwards, so that the middle and ring fingers hold the penis just behind the corona glandis; the index finger and thumb are then at liberty to be applied for the purpose of retracting the prepuce if necessary. The difference may appear to be trifling, but it has a certain convenience in some cases, making it worth while perhaps to acquire the habit with all. The beak of the instrument having been introduced, it should be remembered that during the first two inches, it is to be maintained against the inferior wall of the canal for the purpose of avoiding any hitching at the outset in a lacuna on the roof, sometimes considerably developed, an accident which gives the patient pain, has an awkward appearance, and sometimes disconcerts a young operator not a little. The fingers of the left hand gently draw the penis over the instrument as it glides easily on to the bulbous part, the handle still being horizontal, or nearly so, arrived at which, if some obstruction seems to offer, the instrument should be withdrawn an inch or so, and again passed, taking care not to elevate the handle so soon, after which, by gently raising it and causing it to describe a curve along the middle line, the extremity will probably glide slowly upwards into the bladder as the handle sinks towards the interval between the patient's thighs. If this manœuvre is not sufficient to ensure success in passing the subpubic curve, the operator may make gentle pressure with the fingers of the left hand on the curved part of the instrument, as felt through the soft parts in the perineum, guiding it after he has withdrawn the point, and as he again applies it to the seat of the obstruction. He is now also conveniently situated for subsequently using the left forefinger in the rectum, or otherwise, as occasion may require, the catheter being still held in the right hand.

In exploring the urethra, especially if the symptoms are not such as to render the suspicion that a stricture is present more than probable, we are not hastily to conclude, because a little obstruction presents itself in the passage, that an organic constriction is of necessity the cause. The part is extremely sensitive, and resists any but gentle efforts to traverse it, the more so if it be the first time an instrument has been introduced. The involuntary fibres close upon it, as if to repel the intrusion, and the perineal muscles are prone to contract on the approach of the unwonted stimulus. Some persons always exhibit this involuntary resistance, even when they have become in a measure habituated to the use of a catheter. In such cases no violence may be used: any attempt to force a passage would only increase the difficulty. Gentle pressure steadily maintained, without any poking or jerking of the point, or relaxing of the hand at one moment and increasing its power at another, will sooner or later overcome opposition and carry the instrument through.

Arrived at the neck of the bladder, we may here encounter an obstacle, and still no stricture be present; indeed it is not very uncommon to find the point of an instrument stopped just at the moment the operator thinks all difficulties surmounted. This is more likely to occur with a small instrument than a large one, and with one which is slightly than one which is strongly curved. It has not unfrequently fallen to my lot to meet with this in the living body, and I have occasionally, although very rarely, observed in the dead-house sufficient cause to account for it in the bodies of those who have not suffered from disease in the urinary organs, and have not been treated for any, nor from enlargement of the prostate the obstruction caused by which at this situation is familiar to all. The floor of the canal at the point described, of which it is difficult to say whether it most belongs to the urethra or to the bladder, may now and then be found somewhat elevated, the uvula vesicæ projecting unduly into the internal meatus, or occasionally a band of mucous membrane appears a little prominent, stretched transversely across the opening. Either of these obstacles, it is conceived, would be especially likely to entangle a sound which is not large enough to dilate the passage and ride over such an obstacle, or possesses a form so little curved as to travel too closely along its floor. For these cases, I have found a full-sized elastic catheter which has been kept some time on a strongly-curved stilet, succeed when a metal one has failed. It should be quickly removed from the stilet and used at once before the curve unbends.

URETHRAL EXPLORATION.—The size of an instrument to be used in exploring the urethra for the diagnosis of stricture, is by no means a matter of indifference. A case illustrative of this, which lately fell under my own notice, may be properly quoted here, as it is one which is by no means uncommon or singular. A gentleman presented himself to a friend of the author, stating that he suffered from very narrow, in fact almost impassable, stricture near to the neck of the bladder; that he had been under treatment for some time, and that his former surgeon had on one occasion only been able to get an instrument, which was No. 1, into the bladder, after many attempts, a success which had never rewarded his efforts a second time. In this manner a wrong scent was offered, and unguardedly taken up, and instead of inflexibly adhering to the rule of trying a full-sized instrument first, the operator used a No. 2 catheter, and then a No. 1; both went, as it was supposed, almost into the bladder, but neither entered it. The visit was repeated four, if not five times, and with the same results. I was then requested to see him in consultation, and learned the history already detailed. The patient then stated, in reply to inquiries, that his stream of water had not diminished in size materially that he was aware, nor was the time occupied by the act of micturition unusually long. Uneasiness about the neck of the bladder following gonorrhœa had first led him to seek surgical aid, when the supposed discovery of the stricture was made. Accordingly a well-curved, No. 10, solid sound was introduced, and, to the great astonishment both of the patient and his attendant, went into the bladder without the smallest difficulty. The case was clear and needed no comment; the small instruments had been obstructed by some hitch at the neck of the bladder, over which the large and well-curved one passed easily. A most useful and instructive case was this, and one well worthy to be borne in mind by the young practitioner. But the employment of a small instrument in diagnosing a stricture is objectionable on other grounds. Its point may be entangled in a lacuna, or in some fold of mucous membrane, the first of which would have been closed, and the second obliterated, by the passage of an instrument sufficiently large to fill the urethra, and so perhaps lead to the infliction of injury on the canal, or to the unfounded belief in the existence of abnormal obstruction in it.

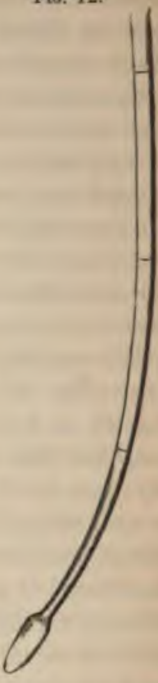
As a rule, therefore, we should always commence, when prosecuting diagnosis, whatever statements the patient may make, with a full-sized sound or catheter, that is to say, not smaller than No. 7 or 8, with a blunt, not conical, extremity, as such will afford far more certain indication of the situation of the obstruction than smaller sizes, which might indeed pass through a slight constriction altogether. If the point be conical, a portion of it may enter the stricture, and the operator be unable to judge so correctly. If the instrument be graduated in inches and fractions of inches, as all metal instruments ought to be, so much the better (it costs very little to make this addition to them), and the exact situation of the stricture should be recorded in the case-book, on more than one occasion.

Suppose then that an obstacle is encountered at any spot by the instrument described (a glance of the eye at the figures marked upon it will instantly denote the locality), and it is found that patient gentle pressure accomplishes no progress, let this be increased a little, and if the penis retreat before it, being evidently pushed backward "*en masse*," there can remain little question as to the existence of organic constriction, the unyielding, semi-resilient nature of the obstruction, a sensation which is communicated intelligibly enough to the practised hand, but which can scarcely be described in words, leaves no doubt whatever on the surgeon's mind. A smaller instrument may now be chosen with which to determine the calibre of the stricture; if this enter the contracted part, it is at once obvious by its being "*held*," *i.e.*, it has entered a narrower passage which fits closely to and retains it, so that on attempting to withdraw at all, a certain amount of force is necessary for that purpose. A trial of several instruments may be necessary, until at last one which is sufficiently small to pass the constriction is arrived at, always bearing in mind that the smaller the instrument the more careful and the more sparing of force must the operator be, since, as must be obvious, such will more easily inflict a wound than those which are larger and blunter, the concentration of that force being in the inverse ratio to the size of the instrument.

This may now be carried on by way of search for another, especially if the first be in the anterior part of the canal. It may, however, be so firmly grasped there, and its freedom of motion be so interfered with, that it is not easy to judge accurately with respect to any obstacles situated deeper in. If so, another kind of sound may be used with advantage, viz., one of small size, having a bulbous or olive-shaped extremity two or three sizes larger than the stem, which also should be graduated; this being made to pass with some little difficulty through the stricture, it will be apparent enough when the bulb becomes free on the farther side, and by observing the graduations, the length of the strictured part is also arrived at. This observation may be checked or corrected at the time of withdrawal. Carrying it deeper still, the existence of another contraction will in the same manner be more readily diagnosed than with an ordinary sound.

USE OF BULBOUS SOUNDS.—I can speak highly of the utility of these instruments in relation to the exploration of the urethra in stricture. If it be necessary to ascertain with accuracy the locality and extent of the contraction, as it certainly is when the surgeon intends to treat it by incision, whether external or internal, the bulbous sound enables him to do so with ease and precision. But in most cases, those, in short, which are treated by dilatation simply, it is desirable, or at all events satisfactory, to have a clear idea of the obstruction to be acted upon. Several of these instruments should be kept, with bulbs varying from the size of No. 1 or 1½ to 6 or 7. The form which I prefer is shown at fig. 12: and it may be also observed, that the lines of graduation in inches, marked upon them, do not commence at the point or lower extremity of the instrument, but at the neck or upper end of the bulb. This renders

FIG. 12.



the observation of their indications more easy. For example: supposing that we pass a No. 8 catheter along the urethra, and find it stopped at 5½ inches from the meatus. Having removed it we succeed in passing a small bulb through and beyond the contracted part, with a slight degree of pressure. On withdrawing it we are sensible that it encounters obstruction the instant the bulb arrives at the inner or distal face of the stricture, and by looking at the graduated scale on its shaft, let us suppose that 5¾ inches are noted, it is obvious, of course, that the stricture is a quarter of an inch in extent, from before backwards. The instrument is then drawn outwards, and the bulb passes with a slight jerk, marking the existence of the narrowed spot. All this should be done very gently, because a stricture is often movable, and may be pushed back or drawn forwards by very little pressure, and thus the measurements rendered incorrect.

Thus much suffices for the question of diagnosis respecting the existence and character of an organic constriction. With respect to what are called model bougies, *i. e.*, instruments adapted to receive impressions from the face of a stricture, I shall reserve some remarks until engaged in the consideration of the best methods of overcoming difficulties in the passage of instruments through the urethra.

The subject of TREATMENT now presents itself.

To accomplish the removal of permanent stricture, two indications are presented, which may be thus briefly stated:—

FIRST, to restore the natural calibre of the canal, or at least so far as shall be consistent with the safety and comfort of the patient.

SECONDLY, to maintain the adequate patency of the canal afterwards.

Now such strictures, as we have already seen, may vary in degree, *i.e.*, in amount of contraction; in extent, *i.e.*, in length from before backwards; in dilatability, in disposition to return, in local sensibility, and in liability to manifest sympathy with other parts of the body through the agency of the nervous system, and in other minor particulars. Hence various modes of treatment are necessary, appropriate to different cases. Hence innumerable inventions for the fulfilling of the above indications have been described, and modes of treatment proposed. It would be misspent time to review all these, even were it possible adequately to do so. Their name is legion. Every medical journal, in at least every one of its annual volumes, presents us with reports, in which the writer recommends some favourite appliance, or brings to light some new instrument, or revives an old one, or insists on the utility of some new application. This is a fact full of import. It shows both the frequency and the importance of the affection, and the want, either of an efficient mode of treatment, or of a rational and systematic application of our present appliances to suitable cases, or perhaps, to some extent, of both.

All these plans however may be resolved into three classes. The opposing tissue of the stricture is either dilated, which usually involves the removal of some of its component elements by absorption, as the result of pressure, or it is wholly or partially destroyed by chemical agents, or it is divided by some cutting instrument; and of course all these processes may be more or less combined with certain general or constitutional treatment.

For the accomplishment of the first, we have solid cylindrical instruments, as bougies made of wax, plaster, catgut, softened ivory, elastic gum, whalebone, and metal, which latter may be flexible or inflexible. Others, which are hollow cylindrical instruments, as catheters, tubes made to slide one over another, dilating or expanding metal instruments, and flaccid tubes dilatable with air or water.

Then, for the purpose of destroying the stricture chemically, both lunar caustic and caustic potash are employed in various ways, hereafter to be described.

And to effect the last indication, there are "urethrotomes" of many forms and varieties to be carried down the urethra to the point of obstruction; or this is sometimes "forced" or ruptured by some means; and there are the operations for exposing the stricture, usually from some part of the perineum, and dividing it from thence.

THE TREATMENT OF STRICTURE BY DILATATION.

As this is the mildest, so it is the most desirable treatment to employ whenever the case admits of it. At the same time it is by far the most generally applicable, as being that which is beyond all question best adapted to cure a very large proportion of all the cases presented to our notice. It is the method which almost all surgeons agree to use as the rule, availing themselves of other means when its action is either not effective on account of the impermeability of the stricture, or insufficient to maintain patency of the canal, from the unyielding nature of the obstruction when passed, or impracticable from the acute sensibility of the urethra, and the consequent pain which results from and follows the operation. The records of surgery show also that it has borne the test of experience longer than any other plan of treatment, having been employed for the destruction of "carnosities" in the time of Galen, and never having been laid aside since, although numberless additions to our means and appliances of cure have been subsequently both invented and forgotten.

It will be interesting, and not altogether an unprofitable task, to trace very briefly the various methods by which dilatation has been employed at different times in the cure of stricture. Catheters for evacuating the contents of the bladder were in use two thousand years ago; some of these instruments, made of bronze or copper, were found among the remains of Herculaneum and Pompeii. Celsus refers to them as made of the latter metal.* Three or four centuries later, silver was substituted, and has continued to be the favourite metal for the purpose ever since. Instruments of horn and leather were nevertheless occasionally manufactured. Among the Arabian surgeons, between the seventh and the twelfth centuries, silver catheters, both curved and straight, were employed.† At the end of this period we first hear of leaden sounds, which came into general use for the treatment of stricture about the fifteenth and sixteenth centuries. Bougies or small wax candles were first used for the same purpose about the middle of the sixteenth century, by Aldereto, Amatus Lusitanus, Phillippus, and Andrea Laguna. These, however, were employed on account of some influence they were supposed to possess from certain drugs which either entered into their composition, or with which the bougies were anointed immediately before their introduction (Petronius, Parè).

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* Catheterism is described by Celsus as applied to the patient recumbent, the surgeon standing on the *right* side. Book vii. 26.

† Paulus Ægineta, in the seventh century, gives full directions for the performance of catheterism in cases of difficulty. Book vi. cap. 59. Venet. fol. 1528.

Rhazes, of Bagdad, in the tenth century, enters into greater detail respecting it.

Albucasis, in the twelfth century, recommended silver instruments (Chirurgia, ii., 59); but is supposed to have invented flexible metallic ones also, made, probably, of lead.

Wiseman, who flourished in the latter half of the seventeenth century, used "the wax candles" unmedicated for the cure of "caruncles" when recent. If obstinate or confirmed, he applied candles of appropriate size, previously scraped to a fine point, and dipped into a heated solution of medicated plaister, until it received a coating of that material. The substances which he employed in this manner were powdered pomegranate, alum, oxide of lead, calamine, sulphate of copper, &c.[*] In other cases leaden probes were passed either down to, or into, the stricture, and retained for some hours in order to induce "a wholesome suppuration." Frequently the lead probe was reserved for maintaining the passage open after the use of caustics, but it was commonly rubbed with crude mercury before its introduction.[†] In the middle of the last century, Daran gained a large and lucrative practice by pretending to have discovered some chemical agent of extraordinary efficacy, which he applied by incorporating it with the materials of the bougie, the composition of which he kept a profound secret, attributing his success to this peculiarity. His manner of employing the bougie, which became generally known as "the suppurative method," consisted in passing one of these instruments into the urethra as far as possible, and in fastening it there by means of adhesive plaister, for four, six, or eight hours; and this process he repeated until considerable suppuration had been set up, which action was assumed to be the effect of a resolution of the caruncle or cicatrix. Daran declared that such a result would not arise from the use of his bougie in the sound urethra, and that the discharge was strictly venereal and contagious in its quality, thus demonstrating the extraordinary power of the instrument to eradicate the disease![‡] Mr. Sharp, of Bartholomew's Hospital, tested these pretensions, and showed that such effects of the bougie were, in the main at least, owing to mere pressure, and not to the assumed "discriminating" power of Daran's composition. Nevertheless, he thought it as well to mix a small quantity of antimony or of some mercurial preparation in the instruments which he himself used, on the ground of the admitted anti-venereal action of the last-named metal.[§] Pure dilatation had, however, shortly before this time been attempted by some surgeons, by introducing through a canula into the contracted part of the urethra, tents composed of materials which would swell with the heat and moisture of the parts, a method which was soon relinquished from the accidents to which it gave rise.

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[*] "Wiseman's Chirurgical Treatises," fourth edition. London, 1705. Book viii. p. 531.

[†] "Cours d'Opérations de Chir.," par Dionis. Bruxelles, 1707. Pp. 188, 189.

[‡] "Observ. Chirurg. sur les Maladies de l'Urèthre," by J. Daran. Paris, 1748.

[§] "A Critical Inquiry into the present State of Surgery," by S. Sharp, F.R.S. London, 1750. Chap. iv.

Daran was followed by Goulard, who employed lead in the composition of his "saturnine bougies," the efficacy of which were for a time highly vaunted. The notoriety which the treatment by medicated bougies now obtained, chiefly through the pretensions set up on its behalf by Daran, was, as Hunter tells us, the means of leading surgeons to discover that "any extraneous body of the same shape and consistence would do the same thing."* And thus during the last half century the bougie and metal sound have been almost universally employed to effect the cure of stricture, not through the agency of any medicinal substance introduced in or upon them, but by means of a certain degree of pressure upon the contracted portion of the urethra; a process to which, by common consent, has been applied the term dilatation. The rationale of this action will be considered hereafter.

In illustrating this mode of treatment as it is pursued at the present day, a case will be supposed in which it may be premised that the diagnosis has been made, and a small instrument has been passed with more or less of difficulty, through an obstruction situated in the bulbous portion of the urethra, a point which has been already shown to be that at which stricture is most frequently formed. The management of those at other points will be considered separately hereafter.

Unless it promise to be more than usually obstinate, the prognosis of such a case, as well as the method to be pursued, are tolerably clear, inasmuch as it is a commonly-accepted maxim, "that the stricture being passable, the cure is in our own hands," and in general terms the truth of this may be admitted.

First, as regards prognosis, for the patient will be almost certain to require an opinion respecting the prospect of success to be anticipated from the treatment proposed, together with the probable length of its duration; or should he not, it will equally be the duty and policy of his adviser to say something respecting these to him; the answer to such inquiries must depend upon the following points:—

If there be but one stricture, and that of not many years' standing, uncomplicated by any of the well-known affections which are wont to accompany old contractions; if it do not present that exceedingly tough and unyielding character, in denoting which it is common to apply the term "cartilaginous;" if it do not involve a longer portion of the canal than the third or the half of an inch; and if the urethra be not unusually irritable and impatient of the presence of a sound, a favourable issue may be confidently predicted. At the same time, unless there are obvious reasons for haste, such as, for example, a necessity existing for the patient to be placed in circumstances very shortly in which surgical treatment is not available, we must resist the temptation to attract him by promises of a very rapid cure. Unquestionably it is in our power to dilate his urethra to any size we please, in a day or two if he chooses, but if we intend the treatment to be safe and sure, and desire the cure to be substantial and enduring, we shall certainly not promise rashly, nor perform rashly, any operations upon him. All this may be explained, and every rational man will acquiesce in our views, and appreciate the forethought, care, and prudence which dictate them. Nothing is more deprecated by patients, and most wisely so, than conduct on the part of their adviser which manifests a want of these qualities, the possession of which is indispensable to constitute a good surgeon. On the other hand, it will be highly culpable not to assure him of the satisfactory nature of his case, and take every means for accelerating his cure which circumstances permit us to take advantage of.

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* "Hunter on the Venereal Disease," second edition. London, 1788. P. 117.

TREATMENT OF A SIMPLE CASE.—Usually a solid sound or a bougie, as large as the stricture will fairly admit, should be passed and allowed to remain some four or five minutes if no pain or spasm are occasioned; probably, however, as much benefit will be attained in most cases by removing it at once as by permitting it to remain, a practical point respecting which there is some difference of opinion among surgeons, and which will be referred to again when considering the rationale of the action of dilatation.* The

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* It has been, and I believe still is, very much the custom in London to leave the catheter or bougie for a few minutes, or even for half an hour, in the patient's urethra at each visit. Experience leads me to believe that no advantage follows this practice as a rule, while sometimes it occasions positive mischief. An excellent observer, who published a work on stricture nearly fifty years ago, containing much sound practical information, writes on this subject so pertinently, and, I believe, so truly, that I cannot do better than quote his opinion in his own language :—

"Our proceedings should be so cautiously conducted, that a bougie, once passed, should be continued for no greater length of time in the urethra than the patient can instrument is then to be withdrawn with as much care and gentleness as was employed in introducing it: a note of the size should be recorded, and the patient desired to come again in three days. The same sound may then be passed, and probably with greater ease than before; if so, it is to be withdrawn at once, and the next size larger introduced; this may now remain a minute or two as before: but if not, let the original instrument stay for that time before trying the next size. The visit should be repeated generally in three days, or it may be in two (but not sooner), if neither pain, nor bleeding, nor much smarting in micturition, follow and continue after the operation. Sometimes a fit of shivering occurs, or the patient may be faint or sick, which are not unfrequent effects of the passage of an instrument, more especially when experienced for the first time. If any of these phenomena take place and are repeated, let the interval be lengthened a day or two, and inquire into the general condition of the health. If there be reason to suspect that the stomach and bowels are loaded, an active aperient may be prescribed, after which the administration of two or three grains of quinine, twice a day, will often prevent their recurrence. It is as well to warn the patient not to make water for at least an hour or two after his visit; nor should he present himself heated by exertion, although a little moderate exercise is desirable rather than otherwise; none, however, of a violent character should be taken at any time while treatment is necessary, especially that which tends to produce congestion of the parts, as running, leaping, horse-exercise, and the like.

If he complains of smarting or soreness of the urethra, and that micturition is painful, the state of his urine should be ascertained, as it is perhaps unduly acid, which will make it desirable to regulate his diet and habits so as to promote a healthy character in the secretions generally. At the same time, if it be so, he will generally

easily bear; for it is the great fault of those who are engaged in the treatment of these affections that, when a bougie is once lodged in the urethra, they are of opinion that it cannot be too long retained; not considering that the introduction of a foreign stimulus too long continued, or too often repeated, must, in a certain degree, excite morbid as well as healthy actions; and, if the former prevail, which will be the case should inflammation be produced, fresh coagulable lymph will be deposited, and a new organization take place. Instead, then, of twenty minutes or half an hour (which is the usual time for each application of the bougie), I seldom continue it longer than a minute or two at each successive introduction. Having once passed a bougie, in this slow and cautious manner, through the stricture, I seldom consider this instrument any longer necessary."—*Luxmoore on Stricture of the Urethra.* London, 1809. Pp. 55, 56.

derive benefit from the following or some similar preparation, which, inasmuch as the correcting of this state will tend to prevent either spasm or congestion of the strictured part, will so contribute to promote the progress of the cure.

℞. Pot. Bicarb., vel,
Pot. citratis, ℈j ad ʒss.
Tinct. Hyoscyami, ♏xx. ad ʒss.
Mist. Camphoræ, ℥iss. Misce.
Fiat haustus ter in die sumenda.

Or, the alkali may be given in decoction of uva ursi, or infusion of buchu, if the mucous membrane of the bladder seems to be irritable, or disposed to secrete too freely. Irritability of the urethra, however, is much allayed by the gentle and careful use of instruments. Even when much suffering is produced at the first attempt, it usually becomes notably less at every succeeding passage of the sound. In some cases, however, where much pain is experienced in passing metallic sounds, a wax bougie or other flexible instrument may be easily borne, and will then be more efficient.

Supposing none of these consequences to happen, the same plan may be continued at each visit, that is to say, the same sound which was allowed to remain in the urethra at the preceding visit is first to be introduced, and then the next larger size should be carefully passed and allowed to remain as before. In this way No. 10 or 11 may be safely reached in such a case as that described, when a very fair amount of dilatation has been achieved: if the urethra is of the ordinary size; if the last step or two in the progress have been easily made, without pain or annoyance to the patient, it is well to go on to No. 12 or 13. In this matter the operator's judgment alone can guide him. Generally speaking, any instrument which the external orifice of the urethra will admit, without appearing to be overstretched, may be safely employed.

An important duty remains. There are very few strictures indeed which do not possess some tendency to contract. Hence some French surgeons have proposed to counteract the effect of this tendency by introducing an instrument to over-distend the canal chiefly at the contracted part. To effect this purpose, peculiarly-formed conical instruments, bellied bougies, "bougies à ventre," which are simply sounds whose diameter is greater by one or two lines at about two inches from the point than at any other part, have been employed.

Practically, no advantage appears to arise from the use of this particular species of instrument. But it is undoubtedly sometimes advantageous, where the tendency to return is strong, to carry dilatation by gradual steps to as high a point as possible, for which end it may occasionally be desirable to make a slight division of the external meatus. I have reached No. 16 in this way, by means of conical steel sounds, with very satisfactory results; this ample dilatation of the stricture appearing to destroy somewhat its contractility. (See Case 13, end of this chapter.)

In all cases, however, the maximum point of dilatation reached, whatever it may be, should be maintained for a short time, the largest sized instrument employed being used at gradually increasing intervals of time, in order to maintain the ground which has been won. Thus the treatment may be relaxed by degrees, making one or two weekly, one or two fortnightly, and finally one or two monthly trials of the instrument. The patient is often extremely prone to neglect this very necessary part of his treatment. Enjoying exemption from all the symptoms of stricture, making "as good a stream of water as ever he did in his life," it appears perhaps unreasonable to require him to continue in attendance upon his surgeon. All that can be done is to explain the true nature of these affections to him, and he must abide the result of his own conduct. It will not then be our fault if he should come again after a lapse of a few months, or perhaps weeks, and tell us that he fears the old enemy is approaching again.

In a considerable number of cases, I think we are bound to instruct the patient to pass an instrument for himself, when the urethra has become patent, and the passage of a sound through it is tolerably easy. The faculty of thus maintaining the canal in fair condition, is often of extreme value to him; and with a little patience and perseverance, may be acquired. When a man has laboured under stricture for years, and has been taught to act for himself, he sometimes acquires a surprising dexterity in its management. I remember to have seen a sailor thus succeed in traversing his urethra with a catheter, in his own way, by sundry extraordinary manipulations apparently of a very heterodox kind, after an experienced surgeon had failed; this was of course the result of some years' practice upon one road only, the windings of which his long experience had made him well acquainted with.

TREATMENT OF A DIFFICULT CASE.—We will suppose a case in which exploration reveals a stricture, but after the trial of a smaller instrument, no penetration is effected. It will be desirable to see the patient make water: if the stream is small, the size of the instrument should correspond with it; if it is not, the contraction cannot be very considerable, and some fold of membrane, or perhaps a false passage, has entangled the point, in which case also the sound to be tried next should be as nearly as possible of the size of the stream. In introducing it we should generally endeavour to avoid the floor of the urethra, as well as any lateral deviation in its course, the sides, and particularly the floor, being, as already seen, favourite situations for artificial passages. Failing of success in this direction, we should next cautiously carry the point towards each of these situations in succession, trying patiently for a short time to insinuate it either above, below, or on either side of the passage, if the slightest sensation of its being "held," suggests a probability that the orifice exists in any of these directions. And when the instrument has thus become a little grasped, we should endeavour to facilitate its progress by patient, continued, and moderate pressure, the precise amount of which should be proportioned to the degree which the patient will bear without much complaining. Let some minutes be devoted to the attempt, the success of which will much depend upon the steadiness and singleness of purpose with which it is pursued. A restless, changeable mode of operating, in which a different manipulation is constantly substituted for the preceding one, so that none consequently can receive a fair trial, is to be deprecated as seldom tending to accomplish the desired object. Above all, a clear apprehension of the anatomical relations of the part is ever to be present, so that the course of the canal with its adjuncts may appear correctly pictured and realised by the mind's eye, in spite of the structures which intervene. Too assiduously or too patiently we cannot study the anatomy of the pelvis and urinary organs, in order to attain that intimate knowledge of them, the possession of which is essentially necessary to a good operator. Frequently when the obstruction is situated far back, the introduction of the left fore-finger, previously oiled, into the rectum, will facilitate the progress of the instrument, either by permitting its point to be raised to some extent, or by enabling us to judge more precisely of its exact locality and relation to the parts around. Whether or no, should fifteen or twenty minutes have elapsed, and success be still wanting, further attempts may be postponed until another visit, as by this time some congestion about the part will probably have been occasioned, and the difficulty be augmented. A much longer period than this, however, may be expended, and often with advantage, provided the manipulation has not caused pain or bleeding; provided, in short, it has been conducted in that careful and gentle manner, which alone is ever admissible or indeed conducive to success. Some three or four days may elapse before the next trial, when we shall know what instrument to use at first, and commence at once by adopting the same gentle plan. The probabilities are, that we shall at all events enter the stricture sooner than at the previous trial, and reduce a larger portion, even if we do not pass the whole. Any advance will be encouraging, but if another visit or two, or even more, be required before a successful result follows, as will sometimes be the case, we shall be amply rewarded by its ultimate reduction, without the infliction of injury upon the canal. None can appreciate the value to the patient of such treatment, confessedly the most difficult to practise, especially for a man of energetic or ardent temperament, laudably anxious to overcome difficulties, and speedily liberate his patient from the presence of impassable stricture. "Festina lente" must be a motto never for an instant to be forgotten; one moment's loss of self-command, and irreparable mischief may be done.

The employment of continued pressure on the face or commencement of an indurated and not very sensitive stricture, is sometimes successful, either by inducing absorption, or by mechanical action upon the yielding materials of the obstruction. The operator, however, should be certain that he is really acting on the contraction, and not following or making a false passage. It is important to remember, as an invariable rule in relation to these attempts, that when the instrument is tightly grasped, the operator may infer that its point is safe within the strictured part, but that when the point feels free, movable, and capable of being withdrawn without appreciable effort, it is certainly not in the stricture; it may be, in such circumstances, in a false passage. If after being grasped or "held" it advances suddenly for a short distance under pressure, and becomes movable, it is very probable that a false passage has been made and the urethral walls perforated; after which unfortunate occurrence all further efforts must be given up, at least for several days, and the employment of instruments, when again resorted to, must be conducted with vigilant care, to avoid any re-opening of the lacerated part.

It is often remarked by students, that although in the lecture-room, *force* is invariably stated to be wholly inadmissible in the use of instruments in the urethra, yet at the bedside the very propounder of the axiom himself may be occasionally seen to adopt it most undisguisedly, as if his theory and practice were at variance, or as if this were an "ultima ratio," a power in reserve, to be applied by no other hands than his own, and so a perplexing paradox has presented itself. I notice this perfectly true and natural remark, because misunderstanding on such a point should not be permitted to exist, nor to act prejudicially, as it must and does, on the minds of those who are receiving the impressions and forming the opinions which will, to a great degree, direct their practice in after-life.

There may be perhaps some cases, although they are certainly few and exceptional, in which more force may be applied by the sound or catheter than could by any possibility be inferred to be either justifiable or desirable from a perusal, for example, of the instructions already given. On this account the question must be fairly met. At the same time it must be evident that no definite idea respecting the amount of pressure implied by the word "force" can be communicated by language. Let it, however, be understood that the word should not be made to bear a full or free interpretation, but the contrary; its meaning may not be strained to include violence, or anything approaching to it. It is certainly not to imply an act requiring obvious effort on the part of the operator.

There are certain conditions annexed to its use, the presence of which is indispensable.

First,—When any degree of force is required, it may only be made *after the point of the instrument has well and fully entered the stricture*, so that the operator is assured that it is in the right track. Force is never to be employed in order to *make a way into it*.

Secondly,—It is then to be increased very gradually, first trying one uniform rate of forcible pressure for two or three minutes before proceeding to increase it, and when it is found necessary to do so the increase must be continued in the same manner for a similar length of time. It is not to be accomplished by pressing onwards with more and more violence until something gives way. This is never legitimate.

Thirdly,—Complete knowledge of the anatomy of the passage, some acquaintance with its diseased conditions also, and long experience in the use of instruments in it, are the indispensable qualifications of the operator, to whom the use of force is permitted.

The following remark, by way of corollary to these propositions, will tend to place the subject in its true light, and show how rarely "force" ought to be applied. Just in proportion to the degree of perfection in which the qualifications described are possessed by an operator, so will his practice appear to be characterised by gentleness and dexterity, rather than by violence.

But it will be asked, when is it justifiable to use forcible pressure? Mere verbal description is scarcely adequate alone to point out cases, in reply to such a question. A few hints in addition to that which has been already said on this subject, will indicate the outline of an answer—Certainly, never until gentle efforts have totally failed. Not when much pain is occasioned by the presence of the instrument; not when much bleeding follows its use; but the mere appearance of blood is not to alarm the operator, for some strictures cannot be touched without giving rise to a little hæmorrhage. If it ever be requisite, it is to effect a passage through one of those old, hardened, insensible contractions, in which the tissues can be felt so thickened around, as to preclude the fear of laceration; and generally some immediate necessity for the opening of a passage, as retention of urine, must be present.

Thus the views I entertain, and earnestly desire to promulgate, respecting such attempts, cannot be misunderstood. It will next be necessary to consider some method of treatment which is applicable to cases in which the obstruction has not, and apparently cannot, be overcome by the employment of the ordinary and gentle means which have been already detailed, and by which the employment of force may be superseded.

A CASE OF EXTREME DIFFICULTY.—A fair trial having been made on several occasions, and the orifice not having been found; or if the instrument have been carried some little way into the contraction, and cannot be made to progress, other plans remain to be tried. The grand object is to get *fairly through a stricture*, avoiding either the making or the following of false passages. To effect dilatation when the way is open requires far less dexterity and patience.

The first part of the operation is that on which all the skill of the operator must be brought to bear.

In such a case, then, we should not commence instrumental treatment until we have, by every possible means, promoted a good state of the general health, and a normal condition of the secretions, by constitutional means hereafter to be referred to. After the lapse of a few days since any preceding attempt, we may now avail ourselves of other aids in the endeavour to pass a catheter. Instead of permitting the patient, even if he is able, to leave his house for treatment, it is desirable to visit him, and of all seasons I prefer to do so when he is in bed, with the skin warm and moist from ample coverings. A hot hip-bath just before the visit is sometimes advantageous.

When introducing the instrument, it is necessary that there should be no chill: all unnecessary exposure should be therefore carefully guarded against. Premising that the precise situation of the stricture has been carefully verified beforehand, a silver catheter should be selected, the size of which should be a little less than that of the stream of urine. In the next place, it will be obvious in oiling the instrument, that the smaller it is, the less will be the quantity of oil which can be made to adhere to it; while it is no less true, that just in the same proportion as the instrument diminishes in size, so does the presence of oil become increasingly necessary. I prefer, therefore, to adopt the simple method of applying the oil *to the urethra itself*, and very freely, rather than to the instrument. In order to effect this, the nozzle of a common glass syringe, containing from four to six drachms of pure olive oil, should be introduced into the urethra as far as it will go, the external meatus being at the same time closed upon the nozzle by the fore-finger and thumb of the left hand, so that none can escape. Gentle pressure being now made on the piston-rod, the oil gradually finds its way down to the stricture; and if this be very narrow, the urethra in front of it slowly fills and becomes slightly distended; but as the piston continues to descend, the oil will gradually pass through the stricture, and onwards into the bladder, thoroughly lubricating every part of the canal. At the moment the oil passes through the stricture, the operator may sometimes distinctly perceive a slight but very complete sensation communicated to the hand, of resistance overcome, and partial collapse of the previously distended urethra in front. The syringe is then to be removed, the finger and thumb still commanding the meatus of the urethra, so that no oil escapes. The smallest catheter may now be introduced, and made to traverse the urethra—at all events, as far as to the stricture—with very little or none of that difficulty arising from the catching of its point against the walls of the passage, so often experienced with very small instruments, and which renders so much care necessary in their employment. But what is more, when arrived at the stricture, the instrument, if adapted in size, will gradually pass through it; or, at least, the probability of its doing so is greatly increased. The narrowed channel has not only been thoroughly lubricated but somewhat distended by the mechanical pressure of the column of oil which has passed through it; and this sometimes occurs to an extent which affords no inconsiderable amount of aid to the operator. On the other hand, in adopting the ordinary method of oiling or greasing a small catheter, no one can doubt that all the lubricating material has been removed long before it reaches the usual situation of stricture, the very part at which, if required at all, its presence is especially needed.

I am satisfied, from my own personal experience, that I have obtained a considerable advantage from the use of oil in this manner. No weight would be added to this assertion by the recital of cases, because the particular influence of any single given agent under such circumstances—that is, one acting simultaneously with several others—must be purely a matter of opinion. The success which has followed its use in my hands has nevertheless been witnessed by several, who have themselves adopted it in consequence. Furthermore, patients suffering with very irritable stricture have experienced so much less pain from the passage of a catheter after the injection of oil, that I have been repeatedly requested by them to employ it on subsequent occasions.

To return to the question of size as regards the catheter to be employed. Repeating a rule which cannot be too strictly adhered to, that danger increases conversely with the size of the instrument employed, we yet may not overlook the fact that experience shows that some of the worst and most obstinate forms of the disease have been proved after death to consist of a narrowing of the channel so extreme, that no instrument which is sufficiently small to pass through it can be made hollow so as to act as a catheter. When such a case presents itself, I have been able to succeed by the employment of smaller instruments than those generally used—at all events, in solid material. But it appears to me to be especially desirable in such cases to use, if possible, a hollow instrument; one that has the power of conveying the urine outwards, and so of assuring the operator that he has fairly and successfully freed the stricture, and has arrived at the bladder. Indeed, the smaller the instrument, the more desirable is it that this practical test of its safe position should be afforded. I have long felt how desirable—indeed, how almost necessary it is to combine in one instrument the quality of tubular construction with minute size; the possibility of making it sufficiently small to be capable of entering the narrowest stricture; and, at the same time, so strong and steady in the hand, as not to bend like flexible bougies, and thus deceive the operator.

This desideratum I have endeavoured to supply by an instrument which may be called "the probe-pointed catheter." I designed it in the first instance, some three years ago, for a case of great difficulty, in which the stricture was considered impermeable; and, practically speaking, had been so to all instrumental attempts both in London and in Paris for many years. Nevertheless, a few drops passed by the meatus, and I was convinced that if I possessed an instrument sufficiently small with sufficient solidity to enable me to guide it, it ought not to be impossible to insinuate it through the stricture. But I felt how doubly necessary it would be with such an one to obtain a guarantee of its safe position by that single result which alone is satisfactory; viz., the outflow of urine through it from the bladder. On my second trial

FIG. 13.

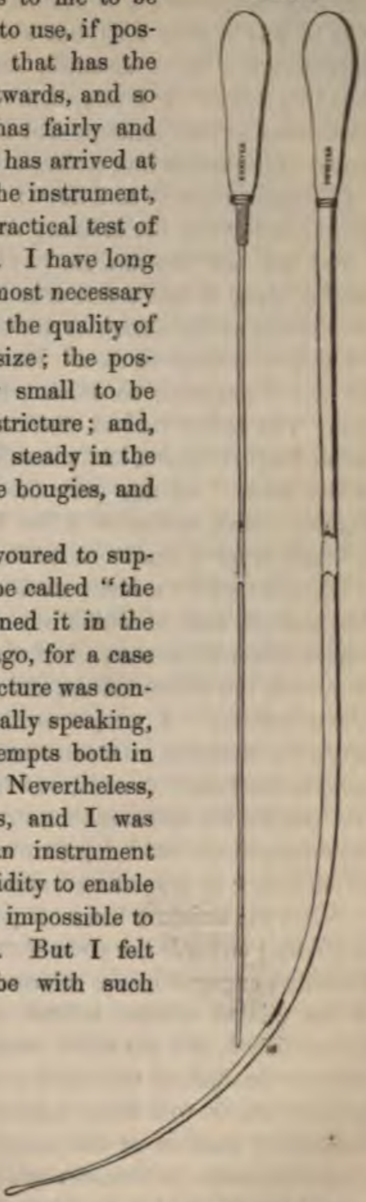


FIG. 13.—The right-hand figure shows the instrument complete. The asterisk placed just below its eye denotes the point at which the instrument becomes solid, continuing so to its extremity. The left-hand figure is the steel stilet, unscrewed and removed from the instrument.

with this instrument, I succeeded in passing the stricture. Small as it is, it was tightly held, but slowly and most carefully pushing it onwards for a short distance, on removing the stilet, the urine issued by drops. I firmly believe I should never have succeeded in overcoming that stricture had I not possessed this slender instrument. The patient now passes a No. 8 weekly for himself.

Its construction is as follows: The instrument resembles in form, length, and curve, the ordinary catheter, and is made of silver.

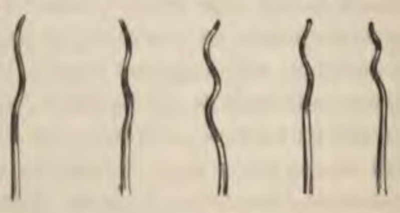
For the last two inches, however, it is perfectly solid, the extremity being in fact a fine metal probe. Accordingly, this can be constructed at the outset, or afterwards adapted to any form or size required by any given case. However small it may be necessary to use the instrument, so small can this probe-pointed extremity be made. The hollow part or channel commences at about two and a half inches from the point, and a small eye is placed on the inner aspect of the curve. At this part the instrument gradually increases in diameter; first, to that of a No. 1, and then to nearly that of No. 2, which latter it continues throughout the whole shaft. The whole is strengthened by a small steel rod or stilet, which accurately fills the interior, and to which the handle is affixed. The small eye cannot therefore become blocked up with mucus or other matters. Moreover, the rod screws in, and gives to the instrument the most perfect solidity. A simple arrangement, which can be understood better by examining the instrument than by any verbal description, permits the handle to slide, and be affixed to any part of the shaft, and enables the operator to use it either as a short or a long probe: the former condition being extremely convenient when a stricture is situated near to the external meatus of the urethra.

When the stricture has been passed, considerable care is necessary in guiding onwards the point through the canal behind, to prevent its becoming engaged in the enlarged lacunæ which are commonly found in the dilated urethra behind an old stricture. This being safely accomplished, and the stilet removed, the urine will issue, by drops only, on account of the small size of the eye, but nevertheless in a manner which will soon relieve the patient, and which at once assures the surgeon of his complete success. The slight but very gradual increase in diameter which the lower end of the instrument exhibits, suffices also to dilate the stricture somewhat; and a No. 1 catheter may generally be made to follow, on the withdrawal of the first instrument, a short time after its introduction. If doubt as to the practicability of this be entertained, a fine gum elastic tube may be passed into the bladder by first removing the handle and stilet, and screwing in its place a long steel rod, over which the tube may glide. Subsequently, the safest and most satisfactory practice is to permit a small catheter to remain in the urethra until it can be replaced by a larger, which usually happens in a few hours.

There is a point, the recollection of which is sometimes of considerable importance, in applying this or any other solid instrument of small size to a narrow stricture. It is the fact, before referred to, that *the orifice of the stricture very frequently does not lie in the direct axis of the urethra;* in other words, it may be situated either to the right or left side, either above or below the normal line of the canal. This is frequently so obvious that attention to the fact, as ascertained in any particular case, may ensure the easy passage of an instrument afterwards; while forgetfulness of it may render success extremely difficult. In endeavouring to find the orifice of the stricture, simple pressure at the seat of the obstruction with the point of an instrument is very frequently not only useless, but injurious, unless the point has entered, and is grasped by the walls of the narrow passage. But by withdrawing the instrument for an inch or so, and carefully sliding it closely *along one side only* of the canal two or three times, then repeating the manœuvre on the opposite side; if this be unsuccessful, by keeping the point closely to the roof of the canal, or, on the other hand, by maintaining it constantly upon the floor, and thus, in a methodical manner, exploring consecutively each aspect of the urethral walls, we may often succeed in becoming engaged in a stricture which could be entered by no other means, or, if so, only by chance. And a recollection of the aspect which proved successful on one occasion will generally enable us to introduce the instrument at a succeeding attempt with very little trouble. I have verified the utility of this proceeding so frequently as always to pay particular attention to the existence of deviation, which appears to me to be more generally present than otherwise, although its extent varies considerably, being greater or less in different cases. Certainly, in half the cases of difficulty which fall to my lot, a note is made in the case-book in reference to the nature and degree of deviation from the axis of the urethra which the orifice of the stricture presents; and I have found such a record of extreme utility in enabling me, on the reappearance of a patient after a considerable period of time, to pass an instrument for him, and with little trouble. In the same manner, also, we may avoid entering a false passage when its presence and situation are verified. The same record has been of equal use to other operators to whom the patient may have been subsequently transferred. Thus, for example, a statement respecting any particular case that the obstruction will be encountered by the catheter at five and a half inches from the external meatus, and is most easily passed by letting the point of the catheter bear gently along the right side of the passage before it arrives at the distance named, may enable the surgeon, who sees the case for the first time, to introduce the instrument into the bladder, as easily as his predecessor, who, after several observations, has verified the condition so indicated. It was a recognition of these variations as often constituting the difficulty in cases of obstinate stricture, that led Sir B. Brodie to recommend an instrument whose point is made to deviate from the axis of the adjacent part, as figured in his well-known work. Leroy D'Etiolles, however, appears to have used, largely and systematically, some exceedingly small gum-elastic bougies, possessing points twisted somewhat into the form of a corkscrew.* He recommends that these should be turned in every direction, until chance guided the point through the devious passage, and he claimed to have achieved a considerable success from their application, a result which appears to be natural. But it is clear that each application must be equally a chance proceeding; for with these long and slender filaments, susceptible of little guidance from the hand applying them, beyond the movement of rotation, it is impossible to learn the character of the

FIG. 14.

Leroy d'Etiolles' twisted bougies.



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* "Sur les Avantages des Bougies tortillées et crochues dans les Rétrécissements," &c., &c., par le Dr. Leroy d'Etiolles. Paris, 1852.

Also, a Second Report to the Academy of Medicine, at its sitting of April 18, 1854.

deviation, or the precise nature of the movement which successfully cleared it. Generally preferred as is the solid instrument to the flexible, I cannot but feel the value of solidity in an instrument in a threefold degree, when deviation of the orifice of a stricture from the axis of the urethra has to be encountered.

The existence of false passages has been alluded to. They form undoubtedly one of the most perplexing complications which the operator can have to deal with, inasmuch as the difficulty of getting into the right opening is greatly increased, by the readiness with which the instrument enters the wrong one. It is advantageous, however, to bear in mind, when engaged in the management of such cases—first, that false passages most frequently commence on a level *below* that of the proper opening;* and, secondly, that the operator's finger when in the rectum, near to which the false passage is almost certain to run, will communicate information as to the route which the catheter is taking, whether it be too close to the gut or deviating to the right or left of the median line: it will moreover be serviceable, in assisting him to guide the point in the true direction.

DIFFICULTIES BEYOND THE STRICTURE.—It is also important to bear in mind, while dealing with an old and tight stricture under all circumstances, that when a small instrument has been passed with some difficulty through it, great care is necessary in carrying the point through that part of the canal which lies *behind* it, on account of the irregular character of the urethral walls, which is not uncommon in such cases. I have exhibited at the Pathological Society several specimens illustrating the condition referred to.† A considerable amount of dilatation of the urethra often exists posterior to an old organic constriction, and frequently, also, a fasciculated condition of the prostatic urethral walls: numerous intersecting fibrous bands appear prominent beneath the mucous lining and interstices of corresponding depth and magnitude between them. (See figs. 2 and 3, page 66.) Sometimes the open sac of an abscess in the prostate, or existing anterior to it, forms a diverticulum, which it is by no means easy to avoid. It is easy to see that the difficulty of the case is by no means surmounted when the point of the instrument has been insinuated through the narrow channel of the stricture. We should not, then, at once push on our acquired success; for here, indeed, is a source of danger, greater in some cases than any that has before been encountered.

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* See notes of numerous preparations in the Appendix, F.

† *Vide* vol. vi. of "Transactions of the Pathological Society of London," pp. 245, 246, 263. Vol. v. of ditto, pp. 208–10.

We cannot be too careful in the management of the instrument after the stricture has been surmounted, not only on account of the difficulty described, but also because the delicate appreciation of an obstacle, especially if slight, is barely possible after the catheter has passed through the stricture; because the grasp of the constriction interferes with freedom of motion on the part of the instrument.

FLEXIBLE AND INFLEXIBLE INSTRUMENTS.—A few words, before proceeding further, respecting the comparative merits and uses of flexible and inflexible instruments. There are general principles which should guide us in distinguishing as to the propriety of choosing either. Neither ought to be used indiscriminately: one or the other must generally be the better agent in any given case. These may be stated in general terms as follows:—When the course which the urethra takes is normal, not made to deviate much from the ordinary direction, by any obstruction external or internal; when its track, although devious, is known, and the position and nature of the obstacles are recognised; when there are good reasons for believing that it is desirable to follow any direction in particular, as along the upper part of the canal only, or otherwise; or when, for want of indication, it is intended to maintain steadily the natural course as the safest to follow: when, in short, we have decided on the way to be traversed, and desire to take the command of the instrument into our own hands, and to keep it there, we must use one which will not yield to impediments, or be deflected from the intended direction by them. When, and only when, we find the obstacles of such a nature, that the only chance of passing them is found in relinquishing the guidance of the instrument and permitting it to worm its own way, then should we choose a flexible one. Lastly: such are generally safer in the hands of those who are unacquainted with the management of instruments in the urethra altogether.

For what other purpose can the operator with reason use an instrument which bends, and the point of which cannot be governed by his hand, than for this? The power of controlling its course is the very last thing I should wish to resign in the management of a catheter, except for those cases in which the abnormities and distortions met with put to nought all anatomical knowledge, and compel me to trust in an instrument whose flexibility enables it to find the passage, without inflicting injury upon the structures around. But such, I must confess, are extremely exceptional.

Nevertheless, I do not hesitate to say, that, on some rare occasions, I have been able to succeed with a small flexible instrument, after failure with a solid one. And strong as is my preference for the latter, I should be sorry not to express my sense of the utility of the former, in some circumstances. The material of the flexible instrument selected, may depend, somewhat, upon the size required. From No. 1 upwards, the gum-elastic bougies are perhaps the best, as being more durable than the catgut, the latter much sooner becoming rough, when of course they must be thrown aside: these also swell a little when exposed to moisture, and thus dilate the contraction somewhat, if allowed to remain in it. Very little benefit, however, if any, is to be derived from this property. When smaller sizes than No. 1 are required we may use one made of whalebone, or one of catgut coated with gum-varnish, if we prefer a stiff or firm instrument; but if we wish to use a very flexible one, we may use the French elastic gum, which can be made of extreme tenuity and perfectly smooth. Having passed it down to the stricture, the penis should be gently elongated, and the opening sought by rotating the bougie on its axis, at the same time that it is pressed in the direction of the passage, and by frequently withdrawing a little, and replacing it, taking care to ascertain if the point be "*held*," when by rotation and gentle pressure the operator may, perhaps, succeed in passing the stricture. Very small instruments are of course apt to be entangled in a lacuna; when, therefore, the stricture is seated far back, it is sometimes advantageous to pass down to it a slightly-curved silver canula, like a catheter with the last inch cut off, and to introduce the fine bougie through it, which may then be worked freely, the canula being still retained. Such a canula requires a bulbous stopper at its extremity in order to ensure its easy passage along the urethra, which being withdrawn on its arrival at the stricture, leaves the canal clear for the introduction and use of the bougie.

Much has been said and written about the use of "model bougies;" contrivances for receiving and exhibiting an impression from the face of a stricture, and so indicating to the operator the direction which the true as well as the false passages take. I believe that less is to be learned in this way than some books appear to teach. However, as a *dernier ressort*, it is worth a trial, although a much less easy and practicable operation than it would appear from description. On some occasions an advantage appears to have been gained by it, and I would therefore by no means consider it worthy of neglect. Civiale advocates the method, and believes it of great value; he uses the common wax bougie. There are several methods of accomplishing the object, and various materials have been used for the model bougie. One of the best is said to be a bougie made in the usual way, but of rather softer wax than it is customary to employ for those in ordinary use; such have been recommended by authors at different periods during three centuries past. A favorite but old-fashioned one contains equal parts of beeswax, diachylon, and shoemaker's wax, of which the extremity may be softened by applying to it a moderate heat. Ducamp recommends that a gum-elastic sound should be carefully pointed with a piece of modelling wax, and managed in the same way; but I have no experience to offer respecting it. Prior to this time, however, Dr. James Arnott had been in the habit of using a bougie of white wax, which he carried down to the seat of stricture in a silver canula, so as to protect the extremity of the bougie from injury during extraction.* There is reason to believe that Ducamp availed himself of this as well as of other of Dr. Arnott's proposals in connection with the treatment of stricture, without acknowledging the source from whence the ideas were derived. Gutta percha has been recommended by an American surgeon as the most useful material. He uses a cylinder of this substance about the size of Nos. 9 or 10, softened at its extremity, for one-third of an inch, by being held over the flame of a spirit-lamp; it is then carried down to the stricture, and maintained steadily against its face for about two minutes.† In consequence of this recommendation I was once induced to try this material, and am compelled to state that I can by no means concur in a recommendation for its adoption. When the gutta-percha bougie has remained in the warm urethra one or two minutes, it becomes so pliable, that if there be a small contraction of the canal anterior to the stricture, the cast of which is required, a condition by no means uncommon, it is liable to elongate considerably in the act of withdrawal, and unless great care be taken, a portion may be left in the urethra. Indeed, the accident has frequently occurred.* It is remarkable how readily this substance is acted upon in this manner. I have never seen a wax bougie indented by the grasp of a stricture so deeply as one of the instruments in question. The material usually sold as gutta percha in this country, appears to possess insufficient cohesive power to prevent its liability to give way and cause an accident, the hazard of which is far too serious to be incurred. I have been informed, however, on good authority, that it is rarely sold pure, that which is so being much more tough and tenacious, while at the same time it is much harder than the gutta percha of the shops.

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* "A Treatise on Stricture of the Urethra," by Dr. James Arnott. London, 1819. Pp. 76, 77.

† Dr. H. I. Bigelow, Professor of Surgery in Harvard University. "Boston Medical and Surgical Journal," Feb. 7, 1849.

VITAL DILATATION.—Another method remains, which was practised by Dupuytren, viz. placing the point of a small gum or metal bougie (the former he inclined to prefer) in close contact with the stricture, and leaving it fixed, so that a degree of pressure is maintained against the obstruction for a few hours. For this purpose it is best, if the obstruction be situated far back, to employ a short gum-elastic catheter, say about No. 1, from which the stilet has been removed, in order that it may be retained in the bladder for a few hours, when it has penetrated so far. But if the obstacle be within three or four inches of the meatus, a solid instrument of the same material may be employed, and its length should not exceed five or six inches, so that it may be tied in close to the extremity of the penis; otherwise, if three or four inches of the sound are left protruding from the orifice of the urethra, it will not be possible to make uniform pressure with the point, or to regulate it properly, or the instrument may even escape altogether. Not more than an inch and a half should appear externally, and at this extremity should be fixed two rings, through which a couple of narrow strips of oiled silk or of tape should be carried down by the sides of the penis, and there fastened to it with adhesive plaister. As the point advances, and the tapes consequently loosen, these latter should be shortened, so that a slight degree of pressure may be steadily maintained, the precise amount of which must be regulated throughout by the feelings of the patient. This plan is available equally for those cases in which no penetration has been made, and for those in which, although some degree of it has been accomplished, still the stricture cannot be passed: but of course, it is inapplicable where false passage exists, as any sojourn of the instrument there could only be productive of serious injury. It has sometimes proved successful, where a good operator has failed by ordinary manipulation. Thus Velpeau, in his "Operative Surgery," writes: "This method, which was pursued by Dupuytren, afforded him success in numerous cases, in some of which it certainly could not have been hoped for." It had also the sanction of Mr. Guthrie's practice and recommendation. The principle of its action, Dupuytren believed not to be mechanical, and explained it by stating that contractions of the urethral canal, which often resist active efforts, are known to give way to passive pressure, long continued, and that it is usual to observe an abundant discharge of mucosity, poured out from the part, as a primary result, after the occurrence of which the sound is enabled to enter. On these grounds, therefore, he designated this process, "Vital Dilatation." * In this way a considerable advance may sometimes be made in the course of two or three hours. It should be added that, in the adoption of this method, although the stricture may not have been passed, the removal of the instrument is often followed by the passage of the urine, in a stream more free than it is the patient's usual habit to make.

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* Many instances have been recorded. See, among others, the "Dublin Medical Gazette," Jan. 24, 1855, for four cases requiring operation after this accident.

CONTINUOUS OR PERMANENT DILATATION.—Among the various means, not of carrying an instrument through an obstinate stricture, but of dilating it; when that necessary preliminary has been accomplished, one of the safest, and at the same time most expeditious, is that of retaining the catheter in the urethra for twenty-four, forty-eight, or even seventy-two hours at a time, without removing it. Especially when great difficulty has been encountered in its introduction, and there is reason to believe equal difficulty would be found in replacing it, were it withdrawn, this plan of treatment is frequently of very great value; so also, if false passages exist; if ordinary dilatation produces little result; if, owing to extreme sensibility of the canal, each introduction of an instrument be attended with so much pain and distress to the patient, and keeps the passage in a state of irritation so great, that the intervals necessary for its subsidence are undesirably long; or, lastly, if it be

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* "Leçons Orales." Paris, 1833. Tom. iii. pp. 141–168.

almost invariably followed by a fit of shivering (repetitions of which, it should never be forgotten, are extremely debilitating), this treatment is, perhaps, one of the best that can be adopted. In putting it into execution, a week or two of confinement within-doors must be reckoned upon by the patient.

At the outset it will be almost unnecessary to say, that a catheter, and not a sound, must be selected for the operation. Having succeeded in carrying it into the bladder, the next step is to fasten it there. For the purpose of doing this effectually, carry a single turn of a broad calico bandage round the waist and fasten it in front; then at a point corresponding, or nearly so, with the crest of the ilium, make in the bandage a small opening, and pass through it about a yard and a half of narrower bandage, carrying one end of it along the groin under the thigh, and up behind the buttock to the same opening to meet the opposite end, to which it is to be tied. Repeat the same process on the other side. Next pass a piece of narrow tape through each ring of the catheter, and tie them on either side to the narrow bandage which lies on the adjacent groin. A little peg of wood or bone must be neatly fitted to the orifice of the catheter, for the purpose of preventing the constant escape of urine; or, better still, a piece of india-rubber tubing may be attached to the end of the catheter. This instrument should not be permitted to project into the bladder, as its point may then injure materially the coats, and produce inflammation, or, at least, much distress. It is borne much better, and for a longer period, when the point just reaches the neck of the bladder and requires to be pressed in for half an inch whenever the patient desires to pass water. Catheters which are not quite so long as those usually employed answer the purpose rather better, since the instrument lies more securely and more easily to the patient, when a short portion only projects from the external meatus.

The patient lies on his back, with the shoulders a little elevated, the knees raised and inclining outwards. It will add materially to his comfort if they are supported by pillows, and if the feet also have something to rest against. Over the centre of the body the semicircular frame ordinarily used must be placed, to sustain the bed-coverings and protect the parts from pressure. The length of time the instrument is permitted to remain, will depend much upon the ability of the patient to retain it. Occasionally, patients suffer so much pain as to render its presence almost unbearable. Generally, however, drawing out the catheter a little diminishes it greatly. But if necessary, we should alleviate it by giving 20 or 25 minims of Battley's liq. opii sed., or by using suppositories;* also by freely administering diluents, as barley-water, rendered either alkaline or acid, as the case may require. If the former, by the addition of a little bicarbonate of potash; and if the latter, which will perhaps be oftener necessary, we may advantageously mix about 40 minims of dilute nitric or nitromuriatic acid with the pint of liquid. If, however, the pain continues very severe after ten or twelve hours, it will be safer to withdraw it, and after resting a day or two the instrument may again be tried.

Sometimes an attack of orchitis results, as occasionally happens also after the mere passage of a sound, or its retention for a few minutes only. The cause must be first removed, and the affection combated in the usual way. An attack of rigors may supervene within an hour from the introduction of an instrument, in which case hot blankets and bottles should be applied to the body, and a full dose of opium given; if they then continue or become severe, it will be necessary to take out the catheter at once, although, especially if much obstruction be presented in effecting its passage, it will be undesirable to remove it on account of a slight attack of shivering, which may be only a transient effect of that operation. Let this be more especially borne in mind, since one of the indications for the adoption of this course of treatment, is that peculiarity of constitution in the patient, which renders a shivering fit the almost invariable consequence of every attempt at instrumental interference with the urethra. When this idiosyncrasy is encountered, the plan of keeping in the catheter for a considerable period is sometimes the most efficient mode of overcoming the difficulty, as it seems generally to arise from the passage of the urine over the urethra, previously abraded or rendered tender by an instrument, and which is for some little time avoided by its flow through the catheter. Thus, I have observed that the attack of rigors rarely follows immediately upon the use of the instrument, but occurs soon after the first subsequent act of micturition has taken place, which may therefore be some hours after. If severe rigors appear for the *first time after the catheter has remained many hours* in the bladder, take it out at once, and apply the treatment just described, as this indicates that the process has been continued as long as is consistent with safety to the patient. Acute pain in the belly and diarrhœa occasionally arise, and require to be met in a similar manner, when some chalk or aromatic mixture, and opium in addition, will generally be required. Experience has taught me also, that when the urine becomes deeply tinged with blood, as it sometimes does after forty-eight or seventy-two hours, it is advisable to remove the catheter, and discontinue the treatment for a few days.

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* Excellent formulæ for these useful appliances are as under :—

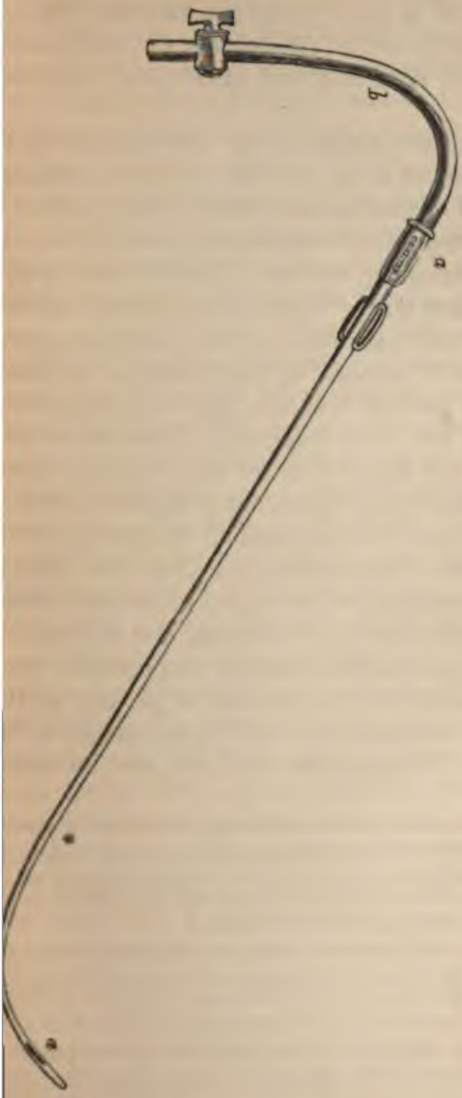
℞. Pulv. Opii gr. ij.
Ext. Conii gr. vj. Misce.
℞. Morphiæ Hydrochl. gr. ½ to ⅔.
Ext. Conii gr. vj. Misce.
℞. Pulv. Opii gr. ij.
Ext. Belladonnæ gr. j.
Cerati gr. vj. Misce.

But all these are exceptional results. Generally speaking the pain is not severe, and after the lapse of twenty-four or thirty-six hours, a purulent discharge is seen around the instrument, which soon becomes loose in the canal, and, if not properly tied in, may readily slip out, although when first introduced it was firmly retained by the stricture. Speaking in general terms, for it will be obvious that no positive directions as to time can be given, in about twenty-four or thirty-six hours from the time of introduction, it should be withdrawn and replaced by another two sizes larger, which will probably enter easily. If the discharge continues profuse, and the urine flows by the side of the catheter, it should be again exchanged for a larger. Usually, however, after three or four days, it is prudent to let the patient rest awhile. A good-sized stream will most likely now be passed, accompanied by some smarting along the canal. He should be permitted to enjoy undisturbed sleep for a night or two, after which the catheter may be again tied in for thirty-six or forty-eight hours more; the discharge will become again profuse, and the canal more patent. (See Case No. 6 at the end of this chapter.) The exact time which it is desirable to carry on the process must depend upon the patient's general condition, the absence of symptoms of cystitis, and the progress made in dilating the stricture. Nos. 8 or 9 having been reached, as will probably be the case in a few days, the patient may be allowed to leave his bed and move about. The introduction of an instrument must now be regularly resumed, at first every day, and then every second or third day, in order to secure permanency to the results already obtained, gradually lengthening the intervals as before described, but not wholly discontinuing the use of the sound for a considerable period: for it must not be forgotten that the subsequent tendency to contract is often very strong, although in this manner its effect may generally be obviated.

Respecting the description of catheter to be used in these cases, one of pure silver is to be preferred as more unyielding than any other, and by many patients very readily tolerated in the urethra. It is also less liable to be blocked up or encrusted with calculous deposit. This may occur with any instrument, but most readily with a gum catheter, the inner surface of which, being rough, greatly favours precipitation of the urinary salts within and about its eyes, from which points it is liable to spread to the outside also. I have seen considerable pain caused to the patient, and some injury necessarily inflicted at the same time upon the urethra, by the withdrawal of one of these instruments with a rough white crust of phosphates on its surface near the apex. The silver catheter should not be permitted to remain more than two or three days, when it can be exchanged if necessary, or washed in some acid solution if there is any phosphatic matter within it. It is often found greatly discoloured by the action of sulphuretted hydrogen, set free from the tissues, upon the silver. The gum catheter is nevertheless much employed in this mode of treatment. A certain advantage which it possesses is this, that when the canal is not only very sensitive, but perhaps a little uneven or circuitous also, the flexible instrument seems to adapt itself more readily to its course; the stilette having been withdrawn, the patient sometimes suffers less than with a solid instrument. This is certainly an indication for its use not to be lost sight of. On the same ground also, if the patient be permitted to move about to any extent, the flexible instrument is preferable. But in these cases it should be removed after twenty-four or thirty-six hours, to clean it and prevent it from being blocked by mucus or other deposit.

In all cases where it is necessary to tie a catheter in the bladder, I have found it convenient to adopt the following method. A bent tube or syphon containing a stop-cock is fitted to the orifice of the catheter, and prevents completely the flow of urine downwards along the outside of the shaft of the instrument, when the patient occupies the recumbent posture. Excoriation of the skin is thus prevented,

FIG. 15.



and that wetting of the linen and bed-clothes, which is exceedingly disagreeable and troublesome, indeed, mischievous, when the catheter has to be retained for a considerable period. Made after the fashion in which it is here seen (fig. 15), there is no very great addition to the expense of a set of catheters, because each instrument is terminated by a socket which fits the syphon, and thus, instead of having a bent tube for every catheter, one may be adapted to all, and a stop-cock at the end of it enables the attendant, or even the patient himself, to regulate the emptying of the bladder according to his necessities. Gum elastic instruments, also, may be adapted to the same bent tube, and with equal facility. A very simple and efficient substitute for the bent tube, and which may be ap-

FIG. 15.—*a*, *a*. A No. 1 catheter, drawn of about half the actual size. The upper or en extremity is enlarged to fit the movable siphon *b*. Each catheter in the set has its per extremity of exactly the same size.

* Indicates the spot above which the shaft begins to enlarge as it rises towards the

plied to any catheter, is a piece of common india-rubber tubing, about 6 inches long, and $\frac{1}{5}$th or $\frac{1}{6}$th of an inch in diameter. One end of this may be drawn over the end of the catheter, and made secure, if necessary, by tying; the other is placed in the vessel used as a receiver.

Respecting the nature of the action set up in the urethra by the *continued* presence of a sound, it has been usually said that the absorbent vessels are excited to unaccustomed activity, and that in this mode the tissues are removed; the correctness of this theory we have, however, no means of determining, neither do I think that it can be regarded as proven. It may not be forgotten that a large and rapid derivation of organic material takes place at the same time directly from its walls, which must be regarded as contributing to the result. This discharge, often very profuse, is chiefly pus, with the *débris* of tissues, epithelium, and a few blood corpuscles. Such an one it is common to observe from any sore not in the act of healing, but in which some decomposition is taking place, and it appears reasonable to suppose that in part at least the disappearance of a portion of the stricture is due to molecular disintegration, resulting from the disorganization of tissues possessing a low degree of vitality, effected by the influence of pressure; and thus it appears that the action of the process is more energetic upon the strictured than upon any other portion of the canal, inasmuch as the pressure is greatest at that point. It certainly does not remove the old fibrous material of the stricture, which is external to the mucous membrane, such as deposit

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upper extremity; below it the instrument has the uniform size of the register for about three inches. The shaft in the instrument here drawn gradually increases in size from No. 1 in this spot to nearly No. 3 at the opposite end, by which additional stability is gained.

b. The bent tube or siphon, with a stopcock. It fits each catheter in the set, or any gum catheter, if mounted with a metal extremity for the purpose.

I have frequently experienced—and I doubt not others have also—considerable inconvenience from some bending of the shaft, when employing catheters of minute calibre (for, being hollow, their metal must necessarily be extremely thin); an occurrence which more or less injures the instrument, and deceives the operator; and I have, therefore, found it useful to employ for the No. 1 and two sizes smaller which I use, instruments of which the shaft is equal in size to that of a No. 2; the latter three or four inches of the instrument only being of the size indicated by the register. This plan of construction gives firmness to the instrument, while it in no way interferes with the passing of that part of it which has to be introduced through the obstruction into the bladder, unless, indeed, the stricture be in the anterior part of the canal, in which case a catheter of the ordinary make will answer exceedingly well. For all larger sizes, the calibre of the catheters may be uniform throughout.

in the corpus spongiosum itself, and which I have felt in the perineum as distinctly after as before the adoption of the treatment. The inner portions are doubtless carried away, but the continuance of the outer layer possessing as much contractility as ever, accounts for that strong tendency to return, which is often displayed very soon after its employment, and which will soon prove troublesome, unless by long-continued occasional dilatation the calibre of the urethra is preserved. Another cause for this, is supposed by some, to be found in the result of the reparative process which follows in the strictured part, after the removal of the sound, by the presence of which the mucous membrane, at that part at least, has been abraded, and perhaps ulcerated; at all events, brought into a condition in which organizable lymph is thrown out upon its surface, and a contractile tissue formed; but this less frequently occurs, perhaps, than at first sight might be supposed, since, unless destruction of the entire thickness of the mucous membrane has taken place, there will be no subsequent contraction. Mere abrasion can give rise to none, any more than it does in the skin. Neither does a sore discharging pus, unless there is loss of substance of the true skin; we have no contraction following the use of an ordinary blister.

SLIDING TUBES.—Among various forms of special apparatus for effecting the dilatation of stricture, I may here describe an ingenious and useful contrivance recently introduced to the notice of the profession by Mr. Thomas Wakley, of the Free Hospital, for removing one of the difficulties already named as an indication for tying in the catheter, viz., the uncertainty of being able to replace a small instrument which has been passed with great difficulty if it be withdrawn. In the treatment of a narrow stricture by this method, a very small catheter is first carefully passed into the bladder. Into the end of this, a small steel rod is screwed, and the whole forms what is termed the urethral guide. The advantage, which will now appear, arises from not withdrawing this instrument until another, consisting of a straight silver tube, has been passed over it through the stricture; so that the route being at first correctly taken, all future efforts will to a certainty be made in the same direction, and with greater ease than if the first, or "urethral guide," were not present.

The same principle directs every step of the dilating process; that is to say, each succeeding instrument may be slipped through the stricture over that which had been originally introduced. In treating a stricture by continuous or permanent dilatation, a tube of elastic gum is introduced in the same manner, and the original guide is withdrawn.

Undoubtedly this plan appears to possess certain advantages for those who are not practised in the use of instruments in the urethra, as, provided that the guide is passed fairly into the bladder, the same route is secured for the tubes which are to follow. But the first step in the process, viz. the introduction of the guide, is precisely that with which all treatment, whatever its kind, necessarily commences; and it is the most difficult and most important step. Once accomplished, the next steps are less difficult, often comparatively easy, whatever the method employed; and the success attained depends less upon any particular apparatus, than on the tact and skill of the operator, which after all constitute the great essentials in the management of stricture.

A different method of using sliding tubes was formerly adopted by Dr. Buchanan, of Glasgow. This instrument, which was called the compound catheter, consisted of a probe-pointed wire, upon which a small silver tube was made to slide closely; over this another, and on that a third glided in a similar manner. Each was a segment of a circle twenty-three inches in diameter, so that while the instrument was curved, the sliding action should be easy. The urethral ends of the tubes were bevelled off, and the apparatus was passed and employed as a whole, the object being to introduce any one of the tubes through the stricture which it would admit, and then pass larger tubes over the first.* This apparatus has nevertheless been published as a modern English invention within the last two years.

M. Maisonneuve of Paris has employed both the sliding tube and the action of the wedge, in the treatment of stricture. In a memoir addressed to the Académie des Sciences, in January, 1845, he thus described the following method, as having been adopted by him, for cases of retention of urine from stricture, through which it was difficult to pass a catheter. "It consists in introducing, first a fine and flexible bougie, which moulding itself to the inflexions of the canal, arrived invariably and without difficulty at the bladder; and then in using this bougie as a conductor over which to slide an elastic catheter open at both ends."

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* "London Medical Gazette," 1841. P. 916. Plates. Dr. Buchanan states that he used this instrument first in 1831.

It is remarkable how frequently the application of this principle has been originated by surgeons of different countries, independently of each other. Thus it was employed by Dr. Hutton of the Richmond Hospital, Dublin, in 1835.* Several French surgeons, among them M. Maisonneuve, have, at different times, claimed the application as a new invention. Can the fact have been overlooked that they were employed by Desault in the last century? When false passages existed, and there was more than usual difficulty in passing an instrument into the bladder, he employed a small elastic catheter, open at both ends, but containing a stilet with an olive-shaped extremity, to close the end introduced into the urethra. Having reached the stricture, he withdrew that stilet and passed another, two feet long, through the catheter into the bladder, then drew out the latter over it, and upon the same conductor slipped in another and a larger instrument.†

Very recently, M. Maisonneuve exhibited a method of dilating very narrow strictures, by using his small conducting bougie in a different manner. Having passed it through the urethra, he screws upon the end which projects from the external meatus, another flexible bougie, a size larger than the first, and pushes it also through the urethra, the conducting bougie at the same time entering the bladder, and becoming rolled up there as it is supposed. The second instrument is followed by a larger, and so on, until by a series of instruments the stricture is largely dilated at a single sitting.‡

METHOD BY EXPANSION.—A certain amount of objection has been generally admitted to lie against all the instruments at present described, on the ground of that abrasion of the urethral mucous membrane, which the passage, even of a sound or catheter, through a stricture with any degree of difficulty must tend to produce, and it equally applies to the sliding tubes just described, however accurately and smoothly they may be finished by the maker, since with all some amount of force is necessarily expended on the walls of the canal, and a proportionate degree of effect must be produced. Hence it has occurred to many surgeons to contrive an apparatus, which, being introduced with ease into the contracted part, should admit of being expanded there, and thus act by eccentric dilatation only, without the risk of injuring by friction.

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* Graves' "Clinical Med." Second edition. Vol. i. p. 555. Dublin, 1848.

† For a detailed account, see "Traité des Maladies des Voies Urinaires," par P. J. Desault. Paris, 1797. P. 310. Edited by Bichat.

M. Pichauzel even received a prize for this method from the Academy of Medicine of Bordeaux in 1810. After that Amussat employed it. M. Rigal recommends it; "De la Pierre." Paris, 1829. P. 22.

‡ "L'Union Médicale." May 26, 1855.

With this view Dr. James Arnott, now about 40 years ago, endeavoured to apply fluid pressure to the dilatation of stricture. He effected this object by passing a varnished silk tube, lined with gut, through the contraction, and distending it with air, water, or mucilaginous fluid, and making pressure by means of a syringe connected with it.* For general employment, however, little can be said in favour of this contrivance. A stricture cannot be very narrow, much less difficult to treat, through which such an apparatus can be made to pass, and can be quite as well dilated by the ordinary sound. In a little pamphlet recently published by Dr. Arnott, it is stated that the apparatus "when made expressly for the purpose, will enter a very tight or narrow stricture." (P. 16.) The following remark, however, which subsequently appears, must be added: "It is indeed more difficult to use a fluid dilator than a bougie, and the surgeon himself ought, if he wishes a perfect apparatus, to be to a certain extent his own instrument maker." (P. 19.) But cases of stricture which are fairly permeable are not generally difficult to manage, and complicated apparatus is wholly unnecessary for their treatment. The principle is a good one which has for its object the substitution of expansion for dilatation, by means of the wedge, which latter is that by which sounds act, as far as their mechanical operation is concerned; but a simple, and at the same time efficient mode of applying it to narrow stricture is, and probably will long be, a desideratum. The objections to the use of well-polished solid sounds are greatly lessened by care and skill in their management, and although a better method may possibly yet be invented, I do not at present know one that deserves the application of that term.†

* "Stricture of the Urethra," by James Arnott, M.D. London, 1819. Pp. 96, *et seq.*

† For other methods of applying expansion, see—

Instruments with Expanding Blades, by Civiale; "De l' Uretrotomie." Paris, 1849. Plates.

Leroy d'Etoilles' method by several metallic rods, "Thérapeutique des Rétrécissements de l'Urètre. Paris, 1849. P. 28, plate.

Reybard's Method by two Metal Blades, "Traité Pratique." Paris, 1853. Pp. 229, 230, plate.

Compressed Sponge, "Gazette des Hôpitaux." June, 1854.

Mr. Luxmoor attempted, nearly half a century ago, to supply the desideratum by employing a metallic instrument with four blades, which, by means of a screw, were made to expand, *in situ*, to any extent required, in four opposite directions.* Many years later, Leroy D'Etiolles adopted the same principle in the construction of some dilating instruments; and, more recently, M. Perrève, of Paris, attempted to fulfil the same object by an instrument formed of two blades united at the extremity, which, by means of a screw, can be separated from each other after they have passed into the stricture.† The imperfection of this arrangement consists in the dilatation being made in one direction only, viz., laterally, while an interval is created between the separated blades, into which the mucous membrane of the urethra is apt to protrude, and to become injured by their edges. Within the last few years, this objection has been partially obviated by sliding down a tube, upon a slender guiding-rod, between the blades; so that, while the dilatation is effected mainly in the same manner as before, by the separation of these blades in a lateral direction, the interval is filled by the intervening tube. This is certainly an improvement on the original model; and for the treatment of strictures which admit an instrument about the size of No. 3, the apparatus is applicable. Mr. Holt, of the Westminster Hospital, has adopted it to a considerable extent, both before and since his first account of the method, which appeared about seven years ago.‡ For ordinary dilatation, tubes of different sizes are employed, each following the preceding by gentle gradations, in the ordinary way. The treatment, however, which Mr. Holt has practised and advocated during the last three years is peculiar, and deserves further notice.

METHOD BY RUPTURE.—Mr. Holt now, however, frequently employs the instrument, not for dilatation at all, but for *forcible rupture* of the stricture. His mode of proceeding is as follows:—Having introduced the apparatus through and beyond the stricture, which may be supposed capable at most of admitting a No. 3, he at once slides down a tube of the size of No. 10, which, with the expanded blades, opens the stricture to at least No. 12. This operation, which is accomplished under chloroform, often requires very considerable force. The instrument is then withdrawn, and a No. 10 catheter is readily passed into the bladder, and at once removed. Some bleeding takes place at the time, and continues for a few hours, rarely more than twenty-four, but only to a slight extent. The stream is at once considerably improved; and, contrary to what might be expected, there appears to be rarely any shivering or fever. Mr. Holt passes a No. 10 on the second day after the operation; on the fifth or sixth; then once a week for two or three weeks; then once a fortnight; and, lastly, once a month. And during the first three or four months the tendency to re-contract does not appear to be considerable; subsequently, it is probably the same as after ordinary dilatation. Through the kindness of Mr. Holt, I have had the opportunity of watching carefully and examining six cases thus operated on by him at the Hospital. In one only were there any febrile symptoms, and these were slight, and disappeared altogether in less than forty-eight hours. I was assured, however, that this was an exceptional occurrence. I am, therefore, free to confess that the immediate results were more favourable than, on *à priori* grounds, I was disposed to expect. It is a fact worthy of attention, that complete rupture of a stricture appears to be less liable to produce shivering and other signs of constitutional disturbance, in other words, "urethral fever," than is mere over-distention in certain cases. This latter, when carried to the extent of only one size of the catheter scale beyond a given limited point, will sometimes produce severe symptoms and much distress; although force, producing rupture, exercised from within outwards, and by an instrument of the largest size, is frequently followed by no such results.

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* "Practical Observations on Strictures," with plates. London, 1812. By Thomas Luxmoor, Surgeon Extraordinary to the Prince Regent, &c.

† "Traité des Rétrécissements," &c., par V. Perrève. Paris, 1847.

‡ "Lancet," 1852, Feb. 7, with plates.

RAPID DILATATION.—The treatment of stricture by "rapid dilatation," not rupture, has always had some advocates. By this term may be understood, the plan of forcibly dilating the contraction, by passing a succession of instruments in a few hours, or days, a process which is therefore altogether mechanical. It requires no special apparatus, and succeeds well in some few cases, where the disease is either not very confirmed, or if so, where the urethra is not very irritable. But experience has long ago proved, that its general application is an abuse; and both English and French surgeons, of high distinction, and with large means of observation, have agreed that it can be safely employed only in exceptional instances. It should never be forgotten, when its application is proposed, that its operation is *mechanical;* that the removal of the stricture by absorption is not effected; and lastly, that if inflammation of the tissues around the contracted part is occasioned, whatever may be the instantaneous improvement, the real elements of the stricture are increased, and its return must be anticipated. Where, however, is desirable to apply dilatation rapidly, I believe there is no method by which we can more smoothly and easily pass through several sizes of the catheter scale in a short period of time, than with the common steel conical sound. This instrument, although long known, has, from certain causes, been less appreciated, I think, than it deserves. In that great majority of cases of stricture for which simple dilatation is, by the consent of almost all surgeons, the safest and most efficient remedy, I think there is no instrument or set of instruments which effects it more quickly, easily, and safely, after Nos. 4 or 5 has been reached by other means. Acting as a cylindrical wedge, bounded by lines of almost imperceptible inclination, and with a surface perfectly smooth and polished, it slowly expands the stricture and accomplishes a larger amount of dilatation in a given time and with greater ease to the patient than any other instrument I know. Six such conical sounds furnish a very complete armamentarium, so that simplicity, to say nothing of economy, is an additional recommendation. The increase of calibre in each instrument should amount to about two or three

FIG. 16.

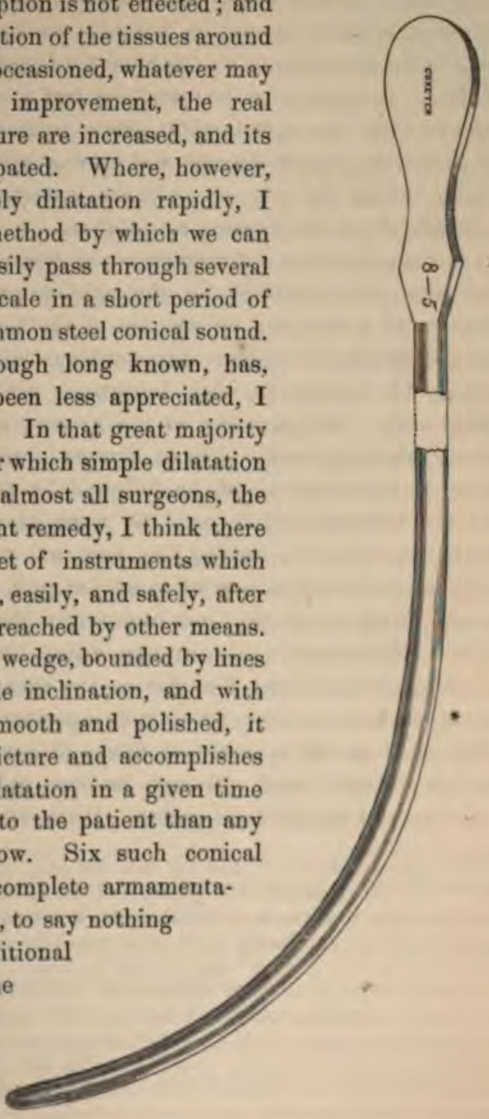

FIG. 16.—The asterisk denotes the spot at which the calibre of the sound begins to diminish. In the instrument selected for illustration here, it is No. 8 in the shaft gradually lessening to No. 5 at the extremity.

sizes; thus, the smallest sound in the set may at its point be of the size of No. 2, and at about three inches from it reach that of No. 4. The next in order should be 3 at its point, enlarging to about 5. The next 4, increasing to 6; the next 5, increasing to 8 (see fig. 16); the fifth 7, increasing to 10; and the last 9, increasing to 12. By means of these six instruments, every gradation of the scale from 2 to 12 may be passed through, not by successive steps with intervals between, as in the use of ordinary instruments, but *by gliding insensibly from one number to another.*

It is quite true that a strong objection lies against all instruments which offer great facilities for the application of rapid mechanical distention of a stricture, on account of the liability to the abuse of their powers which coexists. Irreparable mischief may very easily be done in this manner by their incautious use, as has been already pointed out. Inflammation of the urethra and bladder, which in patients labouring under chronic disease of the kidneys may readily extend to these organs and be followed by fatal consequences, has been not unfrequently induced by want of caution. I have had several opportunities, during the past ten years, of noting more or less marked illustrations of these remarks. It is an instructive fact that, in almost all the cases in question, the ill consequences have followed efforts to dilate the urethra which had already been carried to a considerable extent, *i. e.* just as the maximum amount of distension has been reached, or when an operator has attempted, in the treatment of an old stricture, to dilate to a degree beyond what has been his previous habit, although perhaps only to an extent of one or two sizes of the catheter scale.[*] With elderly patients, who have long been the subjects of stricture; with those especially who possess an irritable temperament, who are readily affected by changes of season or weather; with those who have lived in hot climates, or whose energies are exhausted by the unrestrained exercise of the passions; with those who throughout a great portion of their lives have habitually used stimulants with freedom; in short, with all whose nervous powers have been exhausted in any way, it is necessary to exercise more than ordinary caution in the use of a sound, and to rest satisfied with a condition of stricture which will admit Nos. 6, 7, or 8, if the slightest indication in the shape of a rigor, invariably occurring at any attempt to exceed this limit, admonish us not to go beyond it. There are some old cases which cannot safely be dilated beyond this point or thereabouts. Such patients are tolerably safe if they do not neglect the weekly passage of an instrument in order to prevent the contraction which is certain to take place if this precaution be neglected. This of course refers to those whose cases are not suitable to the employment of other operative measures. (See also "Urethral Fever," p. 97, *et seq.*)

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[*] A considerable number of cases has been met with, but not collected, in which so-called "*rheumatic symptoms*" and suppuration in one or more joints have followed dilatation of a stricture. These, we have little doubt, have been chiefly cases similar to those mentioned in the text. Who can doubt but that the following, extracted at random from Velpeau's "Operative Surgery" (vol. iii. part 8, chap. ii. art. 5), is an example? It is the type of a case one or two of which may be met with in most authors.

"A patient, however, upon whom I had used this process at La Pitié (the use of conical and bellied bougies, '*bougies à ventre*'), was seized with symptoms which it is proper to notice. A conical bougie had been passed after several trials. One morning, this man, wishing to introduce it himself by its head (*chef*), could not succeed, and made the canal bleed. The exacerbation of fever which had accompanied the first attempts was renewed, and continued three days, and did not cease on the fourth, until it was replaced by a violent tibio-tarsal arthritis, which was followed by an extensive abscess, and afterwards by anchylosis. It is true that this leg had been fractured above the malleoli six weeks before. Was this a coincidence, or was it an effect of the same kind as those which are quite frequently caused by blennorrhagia?"

CHLOROFORM.—The influence of chloroform I have sometimes found extremely useful in facilitating the passage of a catheter or sound through the urethra, especially when it is more than ordinarily sensitive, and the pain occasioned by instrumental interference produces uncontrollable and involuntary efforts of resistance on the part of the patient. (Case 5.) He should be rendered insensible in the usual manner, and on some fresh occasion, not after previous unsuccessful attempts on the same day, and then no sound should be introduced until after he is fully under its influence. Let it be remembered that it is not for the purpose of permitting the instrument to be used with greater force than before, but in order to produce relaxation of the muscular tissues, both of the voluntary and involuntary kinds, that the chloroform is administered, and it must, of course, be given to a sufficient extent to ensure this result.

A good deal has been written at various times about the value of belladonna, applied in the form of extract to the face of the stricture by means of a bougie, or to the external surface of the perineum, in overcoming difficult obstructions, and the supposed effect is accounted for by presuming that, in cases in which the difficulty is chiefly due to spasmodic muscular action, it acts by inducing relaxation of the tissues, as it is so well known to do in the case of the iris. It will be unnecessary to enumerate the recommendations of its employment, which have appeared in the form of reports, but it should be stated that in this country, Mr. Tyrrell, formerly of St. Thomas, and in France, Velpeau, have given evidence in favour of its powers. In most, if not all, of the reports which have come under my own notice, its employment has been accompanied by other treatment, so that it would not be possible to form an opinion of its independent effects. Thus, in one of Mr. Tyrrell's cases, it is said, "Mr. Tyrrell ordered . . . . . a bougie, rubbed over with belladonna and oil, to be passed into the urethra. Soon after the man came from the bath this was tried, and after two or three attempts the bougie (which was larger than those used before) readily passed the stricture, and the bladder was emptied of its contents." *

The only method, I conceive, of obtaining results from this agent worthy to be chronicled, must be by adopting its use for cases in which its action can be observed, uncomplicated by the effect of other treatment.

By patient perseverance in some of the methods described, it is probable that very few strictures indeed will be met with which may not be overcome. There is one point, however, of paramount importance in relation to these narrow and obstinate contractions which must never be neglected.

CONSTITUTIONAL TREATMENT.—It is the necessity which exists for rest and careful regimen, before undertaking any treatment, in order to ensure a quiet condition of the parts. When an obstinate case presents itself, and patients will sometimes be met with who state that for five or ten years past no instrument has ever been passed into the bladder, although the attempt has been frequently made, and the operator's mind is satisfied after two or three trials that more than ordinary difficulties are presented, while, perhaps, considerable tenderness of the urethra co-exists, the best plan is to enjoin perfect quiet for a few days, or even for a week or two, in the recumbent position, a mild unstimulating diet, and any medicinal remedies which may be indicated in order to allay irritation of the urinary organs. Indeed, the urethra, in confirmed stricture, sometimes continues or becomes extremely irritable, *i.e.* exhibits much soreness and tenderness, and a disposition to contract rather than improve, during the treatment by ordinary dilatation. In these circumstances it is almost certain that the general health requires attention, or the patient's ordinary habits altering; or that complete rest, not only from active life, but from mechanical interference with the stricture, is for a period necessary. At the same time considerable benefit may sometimes be obtained from the employment of the hot hip-bath, a most valuable, indeed almost indispensable adjunct to other treatment; or in default of this, by the application of hot fomentations to the perineum and hypogastrium. The most effective method of employing it is, according to my experience, to allow the patient to sit in the bath at a temperature which may vary according to circumstances, from 100° to 104°, for a period not exceeding five, or at the most, seven minutes. Greater relief is afforded in this way, than by occupying a longer period at this or at a lower temperature. An impression is thus made upon the skin, its vessels are filled, derivation from the pelvic viscera is favoured, the reverse of which happens from the use of the prolonged bath; and at the same time very little of the debilitating effect is acquired by its daily use for a short time in this manner. After such treatment the chances of success will be greatly increased, whereas while the urethra is congested, perhaps lacerated by recent attempts, there is little good to be done by instrumental interference. The condition of the urine itself will afford the best indications for the kind of treatment required, and this should be submitted both to chemical and microscopical examination. For the tests to be applied, and the appearances sought, see Appendix, where brief but explicit directions are given for pursuing these important researches quickly and accurately, and I can testify from personal experience that they are nevertheless amply sufficient for all practical purposes. The subject is further illustrated by engraved representations of those urinary deposits which are most frequently met with in connection with obstructed micturition, from drawings made by myself from the field of the microscope, chiefly under an object glass of a quarter of an inch focus. See Plates III. and IV.

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* "Medical Gazette," vol. v. p. 735.

If the urine be unduly acid, and deposit the red lateritious precipitate characteristic of an undue excretion of uric acid, or if it be thick and muddy from the presence of urate of ammonia, alkalies are usually indicated, and may be administered in the form of carbonates of soda or potash; or more agreeably, as the citrates of potash or magnesia, while the source of the condition must be looked for in the digestive organs. If alkaline, some causes of which have been explained before, and if a mucous or muco-purulent discharge be present in any quantity, indicating some amount of cystitis, together with crystals of the triple phosphate,—the mineral acids, of which the nitric and muriatic are the best, should be prescribed in connection with the decoction of pareira brava, or that of uva ursi, or in the infusion of buchu, as circumstances dictate, whilst at the same time a nutritious diet will generally be required. At the same time it may be remembered with advantage, that alkalinity of the urine is sometimes more successfully treated by administering alkalies than acids. Dr. Owen Rees, whose views on this subject are new and extremely interesting, has recently given his most matured opinions in a valuable paper in the Guy's Hospital Reports, 1855, an extract from which is placed below in a foot note.* He recommends those salts in which the alkali is combined with a vegetable acid, especially the citrate of potash, and the tartrate of soda and potash; the latter, if the bowels require a laxative, and the former if this is not the case. Both exercise a powerful influence in neutralizing the acidity of the urine, notwithstanding the aperient action which is associated with one of them. I have had many opportunities of witnessing the good effects which have resulted from their employment in my own practice, although I by no means find that the alkaline treatment is invariably successful. I have records of cases in which, after its failure, as well as that of the mineral acids, the use of benzoic acid produced the desired acidity in a very marked manner.*

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* Dr. Rees states that observations have led him "to believe that an alkaline state of urine very frequently resulted from disease of the mucous surfaces over which the urine had to pass before excretion; and that urine which had been secreted, of healthy acid character, was, owing to this condition of the membrane, often passed of strongly alkaline reaction, and containing a deposit of the earthy phosphates as a consequence. The patient, in fact, was secreting healthy urine; . . . . the variation from the normal state consisting in the urine being rendered alkaline by disease of the mucous surface of the urinary passages. That the discharge from the urinary mucous membrane when inflamed, was of a strongly alkaline character, and sufficient in quantity to neutralize the acidity of healthy urine, I proved by an experiment on the inflamed surface presented by the fundus of an everted bladder which I examined, in a case of deficient anterior parietes of the abdomen, a congenital deformity not very uncommonly met with.

"In confirmation of the above views, I took the opportunity of adducing the fact that in several cases of alkaline urine I had succeeded in obtaining the secretion of healthy acid reaction by administering alkaline remedies. These soothed the inflamed mucous membrane, by rendering the urine less acid on secretion, and, therefore, less irritating; and, by perseverance in this plan till the inflammatory condition subsided, the normal acid reaction of the urine, as it passed from the bladder, was eventually obtained."—*On the Pathology and Treatment of Alkaline Conditions of the Urine.* By G. Owen Rees, M.D., F.R.S. Guy's Hospital Reports, 3rd series. Vol. i. 1855. Pp. 300, 301.

This opportunity may be selected as the most fitting in which to advocate the principle of looking well to the condition of the patient's general health in *all* cases of stricture. This maxim, perhaps, has been too much overlooked. In many ways, derangements of the digestive organs in particular, exert an influence upon the urethra. Measures tending to relieve congestion of the pelvic viscera should be adopted, the vessels of the part being usually too much loaded. Moderately free, but by no means active relief of the bowels should be daily accomplished by diet and occasional laxatives, and the functions of the skin should be stimulated by daily ablutions and frictions, in order to lighten, as much as possible, the duties of the kidneys.

There is no doubt that the passage of urine over a diseased and highly-sensitive urethra, tends to aggravate the condition of the stricture; and that if the removal of the secretion could be provided for temporarily by another channel, the urethra would recover considerably in consequence. Hence Mr. Cock has, with this view, adopted puncture of the bladder as a means of treatment, and one which has been in some cases a successful one. It can be fairly advised, I think, only in those cases in which patient catheterism, after several attempts, has been found unsuccessful; and the indication is stronger if numerous fistulæ and much inflammatory mischief exist in the perineum. Believing, as I do, that the cases in which a catheter may not be fairly introduced into the bladder are very rare, I think such employment of the trocar should be correspondingly exceptional. I employed it and with a certain advantage in one such case, the only one in which, since the publication of the last edition, I have found the catheter insufficient. Case No. 8, p. 218.

THE RATIONALE OF THE ACTION OF DILATATION, universally acknowledged as it is to be the most simple and widely applicable mode of treatment for stricture, has frequently formed a topic for discussion among surgeons. Some have regarded the action of an instrument upon the stricture as purely mechanical, believing that it enlarges the passage, the walls of which are composed of extensible materials, just in the same manner as a tight glove or a small hat may be stretched to suit the wearer's proportions. On the other hand, most have felt the necessity of attributing to the act of pressure, some power of producing absorption, and consequent removal of the organized materials of the obstruction; and such reject the notion of dissipating a permanent stricture by the mere mechanical action as untenable, or at least improbable.

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* Further illustrations of this subject may be found in the Author's work on "The Enlarged Prostate," p. 129.

I have long sought to obtain, by observation, some clue to the rationale of the action of dilatation, as a means of cure in stricture. And I think, by regarding closely certain phenomena which accompany its employment, we may obtain some little light upon the subject, and a hint or two useful in practice.

The first effect of passing an instrument gently through a narrow stricture (speaking in general terms, and not of exceptional cases), such an one, for example, as will only admit an instrument of the size of about Nos. 2 or 3 without much pain or irritation, is, that an increase in the size of the stream is noted by the patient on the first succeeding act of micturition. But in the course of a few hours afterwards, the stream is observed to be narrower than it was before the instrument was introduced; there may be even a temporary attack of retention. Subsequently, the stream gradually regains its previous size and force, and in a day or two probably exhibits a degree of enlargement, as the final result of the catheterism employed. The increase, however, is rarely quite equal to that which appeared at the first act of micturition following the operation.

Now, the first or immediate improvement must clearly have been due to the mechanical action of the dilating body on the stricture. No one will imagine that absorption could have taken place so rapidly as to produce that effect: it was, doubtless, mechanical only. The next result observed, or that of diminution of the stream, may be regarded as the consequence of some temporary congestion, together with some spasm, possibly, in the part, arising from the slight degree of irritation necessarily occasioned by the foreign body introduced, a phenomenon which may be designated by the term *reaction;* and this reaction will correspond, other things being equal, with the degree of pressure exerted, and with the amount of sensibility possessed by the urethra. The third and final result is that of gradual increase in the size of the stream, indicating the stage of *subsiding reaction;* during which, congestion disappears, and at the same time the removal by absorption of some portion of the original deposit forming the stricture appears to take place, partly, perhaps, as a consequence of the action by which the recent congestion is dissipated. The rapidity with which these actions follow one another, and the extent to which they are developed, vary greatly in different individuals. It is the existence of undue sensibility in the urethra, or its disposition to exhibit the phenomena of reaction with rapidity and intensity, which in a great measure constitutes that condition of a stricture which we commonly understand as "irritable;" and the extent of which irritability correspondingly prolongs or retards the progress of cure. It is during the last stage, that of subsiding reaction, that the vital or permanent effect (as distinguished from that which is merely mechanical and transient) is obtained. It is then that the true benefit from the employment of dilatation is realized.

Granting that these observations are correct, an explanation is at once afforded of certain phenomena which are constantly noticed by those who are frequently called upon to pass instruments in stricture. Such know practically that nothing is gained by shortening unduly the interval of time usually permitted to elapse between each consecutive application of the catheter; but that, on the contrary, considerable irritation may be sometimes thus induced, and the progress of a case rather impeded than advanced.

At this point, let us call to mind what is the essential nature of organic stricture. It is the presence of a deposit of organized material in and around the urethra, occasioned by inflammatory action, originally set up in the mucous membrane. Bearing this in mind, it should be a cardinal principle of treatment to avoid producing any action which might in any way tend to excite renewed inflammation. A repetition of the catheterism should never be made until what has been termed the period of reaction has subsided, and the disturbing effects of it have disappeared. If we pass an instrument during that period, we increase or prolong reaction, without attaining the permanent benefit of the process which would have succeeded it. It is not possible to achieve progress at that moment. We may pass instruments day after day, but if on each occasion this is done before the period of reaction has disappeared, we shall not only fail to advance, but we shall probably intensify that condition, or convert it into one of inflammation, and thus increase an evil which the same application, were it less frequently employed, would effectually obviate. The golden rule which must guide us in applying dilatation, both in regard of the extent to which it is to be carried at the time, and of the proper length of the interval which is to elapse between each repetition of it, is, to exercise just so much mechanical pressure as can be exerted without producing pain or uneasiness, much less any obvious signs of inflammation, and not to re-apply the instrument during the period of reaction, that is, until any excitement produced by the previous catheterism has completely subsided. The fulfilment of these indications will conduce most safely and certainly, and, in the long run, the most quickly, to a successful result.

From this point of view, we may at once perceive how it is that dilatation, rudely or too rapidly performed, although apparently successful for a time, is likely ultimately to increase the evil which it was intended to avert. Thus it is that a patient with confirmed and long-standing stricture, will frequently observe that his complaint has re-appeared with greater rapidity and force after each succeeding course of treatment. And it will probably appear, in such a case, that the catheter has been employed with undue force, or too frequently, or that some caustic agent has been used with considerable energy; any of which applications, although successful in opening up the passage for a while, may have also induced fresh inflammation, and therefore fresh deposit in and around the existing stricture, a result which is destined, with absolute certainty, to render the stricture at some future period more obstinate than before.

It is probably due in great measure to a disregard of the vital action resulting from its employment, that dilatation has been pronounced by some surgeons inadequate to afford a complete and lasting cure of any stricture, and has been by many unquestionably under-estimated as a therapeutic agent. And thus it is that complicated machines in almost inexhaustible variety have been designed for the purpose of forcibly dilating, and even of cutting out the urethral obstruction. The construction of these appears for the most part to be based on the notion that the urethra is a tube possessing merely mechanical properties, and that its obstructions may therefore be treated by the application of merely mechanical powers. If, however, dilatation be employed by steps sufficiently gradual and with especial care not to excite any degree of inflammatory action, the result will generally be exceedingly satisfactory, not merely in mild cases, but in those of no ordinary severity. But if, while opening the contraction by dilatation, we at the same time irritate unnecessarily or inflame the parts acted upon, we shall at best only afford temporary relief to the complaint at the expense of its future augmentation. Employed in this way, dilatation is assuredly no cure for stricture.

Reasoning from the phenomena observed, it is fair, I think, to infer that most examples of stricture contain two structural elements, physiologically considered, or of one element in two different degrees of development (which, is immaterial to the present question) :—the one, absorbable—the other non-absorbable. The former is removed by the vital action of dilatation; the other is not, but is only amenable to mechanical distension, the effect of which is temporary. It will at once appear that the relative proportion of these two elements determines the degree of success which dilatation, that is pressure inducing absorption, is capable of accomplishing. Probably most strictures in their early stage are composed of materials almost entirely or altogether absorbable; while, on the other hand, the progress of time appears to produce the unyielding tissue which is only temporarily distended by the process. In all cases, probably, a certain proportion of the absorbable element remains, and the removal of this by dilatation is attended by a corresponding amount of relief. When this mode of treatment fails to produce benefit, as for example in those indurated annular strictures in the anterior part of the urethra, well known for their marked contractility, it is probable that the absorbable element is present in small proportion; and that section of some kind is necessary to confer complete relief.

It would be easy to demonstrate by the recital of numerous illustrative cases, that the rationale of the action of dilatation upon stricture here offered, and the principles deduced from it, result from an extended observation of the physiological phenomena which arise in connection with catheterism, but it is unnecessary to occupy space in this manner. The foregoing remarks form a brief record of the facts, which the details of many cases would but present in a manner necessarily less forcible and trite.

In summing up the subject of dilatation, although there are few cases indeed in which, with care and perseverance, an instrument cannot be passed through the stricture, and, consequently, in which its employment cannot be pursued, there are unquestionably some in which its effects are so temporary that its claim to be regarded as a cure for such must be disputed. This is now an admitted fact. Every surgeon who has had anything like extensive experience in the treatment of stricture must have met with such instances. The contraction re-appears, and that so rapidly, that in order to maintain a canal sufficiently patent for the performance of its functions, an instrument must be passed every other day, or even oftener, and thus the patient is subjected to perpetual treatment, and to the confinement and condition of dependence consequent thereupon. While, in a few cases, the urethra is so acutely sensitive that existence is rendered inexpressibly miserable by the torture which the patient has constantly to endure, and the introduction of sounds, instead of producing any beneficial effect, increases the evil and exaggerates the symptoms.

The question is therefore unavoidably presented: Can permanent relief be obtained for such cases, and if so by what method? The consideration of this leads me to the subsequent sections of the subject, and in pursuance of the plan laid down, I shall commence with the next in order, namely, the use of chemical agents in the treatment of stricture.

No cases are given here illustrative of ordinary dilatation, the practice of which is familiar to all, and is fully described in the text. The following examples are adduced as illustrating certain points in the treatment, which it is important to bear in mind.

CASE V.

Old and narrow stricture—Advantages of chloroform—"Permanent" or "continuous dilatation" successfully employed.

A gentleman, æt. 54.—Subject of stricture for twenty years; health tolerably good; symptoms severe; has used instruments for himself, and had much treatment at different times; of late has been unable to pass anything; stream exceedingly slender.

1853. December.—Examination. A narrow stricture at about six inches from meatus. During three visits, only once successful in getting No. 1

into the bladder; but the patient is extremely unmanageable, from excessive sensibility, and irritability of the urethra.

December 14.—He was put under the influence of chloroform at his own house by his medical attendant. No. 1 introduced and tied in. During the night much painful spasm; greatly relieved by opium suppositories.

December 15.—Morning, No. 3; removed in the evening, and No. 5 introduced and withdrawn. To remain undisturbed to-night.

December 16.—Introduced No. 4, and tied in.

December 17.—Morning; urine passes freely by side of catheter; replaced it by No. 6. Evening; introduced No. 7, and withdrew it.

Four days had sufficed to dilate from No. 1 to No. 7. The next morning No. 6 passed, but confinement being extremely irksome, simple dilatation was pursued. An instrument was now passed daily for a few days, to maintain the ground won; after that every three days, and in the middle of January No. 10 passed with ease.

The patient subsequently passed an instrument for himself, at first twice a week, then once a week, and has continued to do so ever since. I have recently seen him, and learned that, by not neglecting this necessary precaution, he has been quite free from all symptoms.

REMARKS.—This is a typical example of the safe and rapid result of the treatment by tying in the catheter. My usual plan is to introduce the instrument early in the morning, and permit it to remain until evening of the following day, or about thirty-six hours; then allow the patient rest for one night, and commence the second thirty-six hours on the following morning. Two or three of these terms are sufficient to dilate very considerably, most of the cases requiring it. The suppository greatly mitigates irritability and spasm (see pp. 191, 192).

It would be easy to adduce numerous illustrations, differing but little from the foregoing. Occasionally, for example, the progress is not quite so rapid; sometimes the patient requires an interval of thirty-six hours' rest instead of twelve, in which case a little of the previous advance is lost. Commonly, the second term is productive of greater advance than the first, and the third than the second. During the second term, a free discharge from the urethra usually takes place. If at any time the urine becomes mixed with blood, I withdraw the catheter, and do not pass an instrument again for a day or two. Generally speaking, the patient should have nutritious food, and some stimulant, also, if accustomed to it, during the time of treatment. With a cradle over the body, an india-rubber tube from the catheter, to remove the urine, and *the end of the instrument only just reaching the neck of the bladder*, a patient may be treated thus with very little discomfort. If there is much pain, elastic catheters can be used instead of silver, but the improvement is perhaps somewhat less rapid.

Case VI.

Old-standing traumatic stricture and fistulæ —"Continuous" dilatation rapidly successful.

P., æt. 43.—Sent to me, by Mr. Harrinson, of Reading, at University College Hospital.

1857, September 8.—Admitted under my care to Ward I.

A long history of stricture from injury to perineum from blow on pommel of saddle. For last four years urethra impermeable to instruments; and the subject of perineal abscesses and fistulæ.

September 9.—Examination. Stream very slender; urine chiefly passes through two openings in the perineum, which is indurated and deformed. No. 8 passes six inches, where the stricture is situated. After twenty minutes' trial, could not succeed in passing any instrument.

September 11.—Second attempt. After a quarter of an hour, introduced No. ½ into the bladder; drew off urine; instrument very tightly held. Orifice of stricture was gained by keeping point of catheter closely to the right side of urethra. Tied in the catheter.

September 12.—Replaced it by No. 2; painful; a suppository of two grains of extract of opium, and one of belladonna immediately; to be repeated at night.

September 13.—Instrument removed. To remain quiet to-night.

September 14.—Introduced No. 1; tied in; repeat suppositories.

September 15.—Passed No. 4, and tied in. Says he can bear instrument well if the suppositories are supplied.

September 16.—Removed No. 4. To rest to-night.

September 17.—Introduced No. 3, and tied in.

September 18.—Replaced it by No. 5.

September 19.—Passed No. 7, and removed it at once; fatigued; to rest two nights.

September 21.—Introduced No. 6, and tied in.

September 22.—Replaced it by No. 8.

September 23.—Passed No. 9, and removed it.

The next few days, Nos. 8 and 9 were passed every day, but not tied in, to maintain the ground gained. The fistulæ have healed.

September 28.—He was sent back to the country. He passes his water in a full, healthy stream; does not rise more than once in the night; the fistulæ have healed, not a drop of water passing by them. His health is excellent. To come up once a week on my out-patient day, to have an instrument passed.

The patient did this a few times, in order to learn to pass No. 8 for himself, which he very soon accomplished.

June, 1858. He called at the Hospital to show himself. Perfectly well, and using his instrument once a week.

Remarks.—The observations in the preceding case are applicable to this. The main object being not merely to adduce another example of the admirable results of this method, but to show that, during its employment, old fistulæ also will heal soundly. No method by dilatation can be more safe, rapid, or efficient. The entire term of residence in the Hospital of this patient was three weeks.

Case VII.

Long-standing stricture, causing very frequent attacks of retention—This tendency overcome by over-distension.

A gentleman, æt. 48.—Has had severe symptoms of stricture many years, and a great deal of treatment from various surgeons. He has passed his own instrument, a No. 7, for years, but, nevertheless, is subject to frequent attacks of retention from slight causes.

1857, April.—I found a slight contraction at nearly six inches from the orifice, and a thick ring of tissue could be felt there in the perineum, through which No. 7 passes tightly. I carried dilatation up to No. 12 with very marked benefit. He is to return to the country, passing No. 10 twice a week for himself.

In November, 1857, he applied to me again. Gradually he failed in passing No. 10; then No. 9 passed with difficulty, and the attacks of retention were again frequent. I now carried dilatation by conical steel sounds gradually up to No. 16, without force or drawing blood; and he passes Nos. 12 and 13 for himself once a week. He has had no retention or any sign of it since (July, 1858).

Remarks.—An example of a few exceptional cases which are met with, in which a stricture, never narrow, but well marked, produces a train of troublesome symptoms, the foremost of which is very frequent retention, rendering catheterism necessary, although No. 7, or even No. 9, may be passed. I have seen one of these cases successfully treated by Mr. Syme's operation in the practice of my friend Mr. Coulson; and Case No. 15, in which I pursued the same course, somewhat resembles it (see end of Chapter IX.)

In the present instance I adopted "over-distension," passing instruments on alternate days. The urethra was, on each occasion, injected with oil; steady, carefully-exerted pressure with conical sounds opened up the passage from No. 9 to No. 16 in nine visits. The meatus was slightly divided towards the end of the treatment.

CASE VIII.

Gonorrhœa—Old-standing stricture—Numerous fistulæ through which the urine passes—No instrument can be passed through the stricture either before or after death—Relief from puncture of the bladder.

W. J., æt. 58.—*More than twenty years* has had stricture, with a long history of severe symptoms, frequent retention, numerous scrotal and perineal abscesses, &c., &c.

For two and a half years past has been a patient in the Provincial Hospital, from which he has been sent to me.

October, 1855.—*Present state:* Very weak; great irritability of bladder. Almost all the urine passes through perineal and scrotal fistulæ, which are numerous; occasionally a few drops by meatus. Perineum and scrotum greatly thickened and deformed by inflammatory deposit.

After repeated efforts I failed to pass any instrument through an exceedingly tight and irritable stricture about three inches from the meatus. The smallest probe was held, but could not be passed through it.

The constant flow of decomposed urine through all the fistulæ produced so much inflammation and distress that I resolved to provide for its removal in another channel by puncturing the bladder, which I did, November 28, assisted by Mr. Mushet and Mr. Balding. About six ounces of water were thus removed.

The great amount of swelling and deformity in the situation of the perineum and scrotum prevented my cutting down upon and seeking the urethra behind the stricture, which otherwise I should have preferred doing.

In a very few days the improvement in the condition of the parts and in the comfort of the patient was very marked. On December 3 I removed the canula, and the urine passed from time to time by the opening into the rectum.

In the course of the month he got an attack of dysentery, which proved obstinate in spite of all treatment employed, and prevented the use of catheterism, which it had been hoped might be successfully tried, now that the urethra had been free from the irritation of the urine for some time. He ultimately died of exhaustion from its effects, on the 21st January, 1856, about two months after the puncture of the bladder.

The post mortem exhibited a stricture about three inches from the orifice so narrow that no probe or catheter of the smallest size could be insinuated through it. The parts around were remarkably indurated. Behind the narrowest part of the constriction the urethra was contracted and tortuous for about half an inch in length, and minute fragments of calculous matter were impacted in it.

CHAPTER VII.

THE EMPLOYMENT OF CHEMICAL AGENTS IN THE TREATMENT OF STRICTURE.

Chemical agents—Their employment by the older surgeons—Practice of Ambrose Paré—Wiseman's method of using caustic—Dionis—Hunter's practice—Home's practice—Whateley and the potassa fusa—His method of employing it—Practice of Dr. Arnott—Of Ducamp—Mr. B. Phillips on the use of caustic—Subsequent remarks by Mr. Phillips—Practice of Leroy d'Etiolles—Mr. Wade—Mr. H. Smith—Difficulty in arriving at correct conclusions respecting the effects of caustics—Comparison of the actions of the two caustics upon mucous membranes—Action of the nitrate of silver—Action of the caustic potash—Inability of the nitrate to destroy a long stricture admitted by the chief advocates of its use—Home's reports prove this—Nitrate of silver useful in certain cases—Potassa fusa much more powerful, and should be used with great caution—Caustics never to be used as escharotics—Conclusions respecting the employment of chemical agents in the treatment of stricture.

No better proof exists, if such were wanted, that the process of dilatation is not a universal and complete remedy for stricture, than the fact, sufficiently notorious as it is, that innumerable methods have been recommended on high authority to supply its deficiencies.

Thus we find early records in the writings of the old surgeons, of proceedings which they practised when the use of the wax bougie or leaden sound had proved insufficient to overcome what were believed to be "*caruncles and carnosities.*" Incisions were made at the obstructed part by means of instruments passed through a canula, and by the same means escharotics also were applied. These, which were extremely numerous and potent, are detailed, and their mode of applying them described by several writers in the sixteenth century, among whom are Alphonzo Ferri, Amatus Lusitanus, Andrea Lacuna, Philippus, Christopher de Vega, and Francesco Diaz. The three first named appear to have been the earliest authors of monographs on the subject, and from them we learn that they employed bougies smeared with ointment containing verdigris, butter of antimony, quicklime, arsenic, alum, vitriol, &c., &c.*

In the year 1603, Mayerne, of France, operated by incisions upon Henry the Fourth, for which he was severely censured by the Faculty of Medicine of Paris; and Jean Baptist Loyseau, of Bordeaux, afterwards successfully treated the royal patient with escharotics, that is, by means of bougies containing savine; a result for which he was created surgeon to his Majesty. Still later, in the works of Ambrose Parè, the surgeon is recommended to pass through the catheter "a silver wier, sharp at the upper end," . . . . "that by oft thrusting it in and out, it may wear and make plain the resisting caruncles." After this comes the description of a catheter with "prominent cutting sides, upon which, after it has been thrust into the urethra, the yard is to be pressed on the outside close, with your hand, in the place where the caruncles are." Next an escharotic is to be applied in the manner following: "℞. Herb. sabin. exsic. ℥ii; Ocræ.; Antimon. tut. præp.; ana ʒss. ft. pulv. subtile. Put the powder into the pipe or catheter having holes in the sides thereof . . . . then put the catheter into the urinary passage until the slit or openness of the side come to the caruncle; then into the hollowness of the catheter, put a silver wier, wrapped about the end with a little linen rag, which, as it is thrust up, will also thrust up the powder therewith, until it shall come to the slit against the caruncle, then will it adhere to the caruncle, bloudy by reason of the said attrition."†

Richard Wiseman, who practised during the latter part of the seventeenth century, and who was serjeant-chirurgeon to Charles II., gives elaborate instructions for a long course of physic, as well as for the composition and use of medicated bougies, for the extirpation of "caruncles and carnosities" in the urethra; and moreover directs, that in cases in which this treatment is not successful, "you may pass a canula into the urethra to that caruncle, and whilst you hold that there steady you may convey a grain of caustic into the canula, and press the caustic to it, and whilst you hold it there you will perceive its operation by the pressing forward of the canula." *

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* "De Caruncula sive Callo." By A. Ferrius. 1551. Chap. ix.; in the "Thesaurus Chirurgiæ" of Uffenbach. Frankfort, 1610. P. 1015. "Curationum Med. Cent. quat." By Amatus Lusitanus. Ven., 1557. Pp. 537–542. "Method. Cognosc. et Extirp. Excresc." By A. Lacuna. Romæ, 1551.

† The works of Ambrose Parè. Translated by Johnson. London, 1678. Pp. 443–445. An engraving of the instrument alluded to is appended.

In the very commencement of the eighteenth century, Dionis gave instructions in his well-known "Cours d'Opérations de Chirurgie," for applying caustic to those strictures through which a probe could not be insinuated, in the following manner. He applied the caustic agent to the end of a wax bougie, and introduced it as far as to the stricture, leaving it there for some time. By this means, he says, a small portion will be consumed and thrown off. This process was to be repeated every day, and continued until the passage is free. The surgeon is warned not to be in too great haste, nor to use caustic too strong, lest it should cause inflammation and retard the cure. Afterwards dilatation is to be kept up for a short time, as well as the application of "desiccative liquors," by means of a leaden probe rubbed with quicksilver, in order to keep the passage open "until it cicatrise anew." †

In our own country, at the latter end of the eighteenth century, John Hunter called attention to the use of escharotics by his writings and practice. The idea of cauterising stricture appears to have been an original one with him. After trying the effect of red precipitate in his first case without success, he confined himself to the employment of nitrate of silver, and, in explaining his views respecting its action, commences by laying down the axiom, that where a bougie can readily pass there is no necessity for the use of any other method. But that inasmuch as the stricture may be too tight to admit one, a condition which he says "very rarely occurs," or may not be in a line with the urethra, or the canal itself may be obliterated altogether, the caustic will be found for such cases a most efficient remedy.

The mode of application was as follows: he first passed a canula down to the stricture, and through it introduced a small porte-crayon containing a piece of caustic, which he allowed to remain in contact with the obstruction for one minute, repeating the process, if accidents did not occur to interfere, every other day. As soon as the stricture admitted a bougie, the treatment thenceforth consisted in simple dilatation. ‡ He confesses that when the contraction is of

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* Works of Richd. Wiseman, 6th edition; published after his death, in London, 1734. Vol. ii. p. 413.

† "Cours d'Opérations de Chirurgie," par Dionis. Paris, 1708. P. 189.

‡ Op. cit., 2nd edition, pp. 125–128.

some length, and irregular, he should fear to continue the use of the caustic sufficiently long to reduce it. After more experience, especially of the difficulty of applying caustic accurately, to obstructions situated at the sub-pubic curvature, Hunter abandoned the canula and used what has been since called, an "armed bougie." This consisted of an ordinary wax bougie, in the end of which is imbedded a small piece of nitrate of silver; this was passed rapidly down to the stricture, retained with a moderate degree of pressure against it for about one minute, and then withdrawn. This appears to have been precisely similar to the method of Dionis as regards the manner of application.

After this, Sir Everard Home, who was a pupil of Hunter, not only continued to employ this agent according to his master's directions, but extended its application to permeable strictures, making its use the rule, and that of simple dilatation the exception, which latter he appeared to consider adapted only to the mildest and most recent cases.

At the beginning of the present century Mr. Whateley published a small volume, in order to advocate the superiority of the potassa fusa, as a chemical agent, to the nitrate of silver.* He considers that "caustic in any form or quantity ought not to be used, till a bougie, a little larger than one of the finest size, can be passed through all the strictures into the bladder," lest retention should be caused, and makes this proceeding an indispensable prerequisite to the operation, stating, "that in the worst and most contracted strictures he had ever met with, he had sooner or later almost uniformly succeeded in procuring a passage into the bladder by means of fine bougies." His method of employing it was as follows: A plaister bougie is to be selected, which possesses sufficient firmness not to become soft and pliant in the urethra, and of a size just large enough to enter the stricture. This is to be passed down to the point of obstruction, and a mark made upon it with the finger-nail, exactly half an inch from the extremity of the penis. When withdrawn, its extremity is to be pierced with a large pin, and into the orifice thus made, a piece of fresh and hard caustic potash inserted, "less than the size of the smallest pin's head for the first application," sinking it a very little below the margin of the hole, pressing round it the end of the bougie, and filling up any vacancy with lard, to prevent the possibility of its falling out. The instrument is now to be oiled, and passed quickly down to the stricture, care being taken to ascertain that it has arrived at the required spot, by attention to the mark, and its relation to the extremity of the penis; it is now to rest there some seconds, then to be pushed gently forwards about an eighth of an inch, allowed to rest again, and then carried forward in the same gentle manner till it has got through the stricture. When this has been accomplished it should be slowly drawn backwards and forwards through the contracted part, two or three times, and then removed altogether. This process is to be repeated at intervals of a week, increasing the size of the bougie as it can be admitted, but taking care always to pass the bougie fairly through the stricture before arming it, that its passage then may be insured. At no time is the particle of caustic potash to exceed in weight the twelfth of a grain.

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* Whateley's "Improved Method," &c. London, 1804.

In those rare cases in which he was unable to pass a fine bougie into the bladder, Mr. Whateley was accustomed to attach a small portion of nitrate of silver, a fractional part of a grain, to the extremity of a bougie, and press it against the obstruction. He preferred this agent to the caustic potash, which, he says, should be resorted to only if the former do not succeed, and then in exceedingly minute quantity, as he considered the alkali too active an escharotic to be applied to a surface so limited in extent as the face only of a stricture. He also appears to be the first who systematically applied caustic to the inner surface of the stricture, which he did by applying to the end of a bougie of the smallest size, first a little glue, and then some finely-powdered nitrate of silver, after which "it may," he says, "be readily passed into, or a little beyond, such strictures as are extremely narrow."* Subsequently, Dr. Jas. Arnott advocated a similar but improved practice. His method was as follows: Having ascertained the situation and calibre of the stricture by means of a "model bougie" of soft wax, he passed down to it "a canula having its extremity filled and rounded by a button," which formed one end of a stilet, to the other end of which a dossil of lint was attached. The stilet being withdrawn, the lint was introduced to absorb moisture, and after its removal he passed down a slender metal rod, upon which, near its point, a thin film of the caustic had been made to adhere by fusing. The rod was made a little smaller at the part to which the caustic was fixed, so that after that process the volume of the instrument was equable throughout, and the layer of caustic not projecting beyond the surface of the rod, was not rubbed off by its introduction within the stricture.*

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* "Observations on Home's Treatment," &c. London, 1801. P. 68.

In France, the employment of caustic was revived in modern times, by Ducamp, who in a work on "Retention of Urine," published in 1822,† advocated Dr. Arnott's treatment at considerable length, although without acknowledging the author, and made some very slight additions of his own. Subsequently, Lallemand, Segalas, and others, have suggested numerous modifications of these instruments.

At the present day caustics are not largely employed, and of these it is difficult to say which agent is most in repute. Mr. B. Phillips formerly spoke in high terms of the curative powers of the nitrate of silver. But he approved only of its introduction within the stricture, and its application consequently to the diseased part alone, reprobating its application to the face of an impermeable obstruction. In such a case he recommended a slight incision of the stricture within the urethra, in order to facilitate the subsequent passage of the caustic instrument. The method he employed is that which was designed by Arnott, and modified by Ducamp and Lallemand. The instrument consists of a canula and strong stilette, with the end of which latter is connected a small cuvette, containing some of the solid nitrate which has been melted into it; this is projected into the contracted part and revolved *in situ*, taking care that the caustic is not permitted to remain unsheathed for a longer period than one minute. This apparatus, which bears the name of Lallemand, is sufficiently well known, and needs no further description, a larger form of it being in common use for application to the posterior part of the urethra in other affections. But Mr. Phillips's subsequent remarks upon the use of caustics are valuable, as expressing a more matured opinion. They are as follows:—

"There was a time when I felt a strong conviction that caustic was the most certain curative agent in the treatment of stricture; a longer experience has satisfied me that conviction was not well founded. I believe we know no means of effecting a permanent cure of advanced cases of stricture; but I think the best means we possess is the prudent employment of dilatation. You can always make the canal free by this means; and although it will commonly manifest a tendency to contract anew, yet the occasional introduction of a bougie may prevent the disposition from proceeding so far as to cause inconvenience. I do not doubt the cures that have been attributed to caustic, but in my opinion they have been mainly owing to the dilatation exercised by bougies and porte-caustiques, employed in the treatment. I apprehend the good derived from the use of caustic is owing to the modification of the sensibility of the canal, which has allowed of a more unreserved use of dilating bodies than could have been had without it."*

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* "A Treatise on Strictures, &c." London, 1819. And 2nd edition, 1840. P. 157.

† "Traité des Retentions d'Urine." Ducamp, Paris, 1822.

FIG. 17.

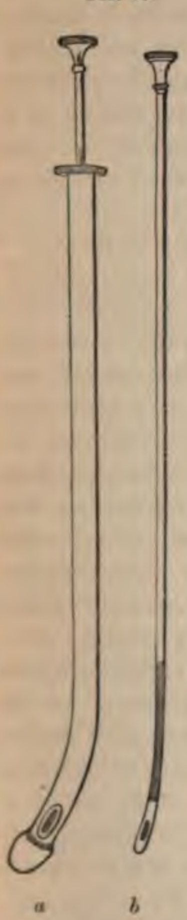

FIG. 17.—Leroy D'Etiolles' instrument for "lateral retrograde cauterization."

a. The canula.
b. The caustic holder.

Some of the modern French surgeons appear to have used nitrate of silver largely. Leroy D'Etiolles has written at length on the subject, and described peculiar methods of employing it. He likewise requires, as a condition for its use, that the stricture should be capable of admitting an instrument, as he seeks most carefully to avoid any contact of the agent with the healthy structures around, which he says inevitably tends to convert a short and simple contraction into a long one, by giving rise to inflammation. He disapproves of Lallemand's instrument, because the cuvette is apt to be retained forcibly in the stricture, by the spasmodic action which is almost invariably set up around it by the stimulus of the caustic, and is difficult to withdraw until all the caustic is dissolved. Hence he employs a canula, having two or three lateral apertures in it near the extremity, which is formed by an olive-shaped bulb. He selects a canula of a size that can be passed through the contracted part, and passes it as far as to the prostatic region; then withdrawing it, ascertains the situation of the stricture by means of the bulbous extremity, and stops there. He then passes down some nitrate of silver, attached to a flexible stilette, and cauterizes the parts exposed at the apertures, by rotating it. When very small instruments have to be used, the stilette will necessarily carry but a very small portion of caustic, in which case he recommends that two or three should be ready prepared to pass in succession down the canula, which is afterwards gently withdrawn. This method he distinguishes by the term, "*lateral retrograde cauterization.*" The smallest size which can be used equals No. 3; so that if it be ever necessary to use caustic to a very narrow stricture, Dr. Arnott's simple method appears preferable. But it is only fair to our French brethren to state that the use of caustics is now almost universally reprobated by them.

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* "Medical Gazette," December, 1843.

Mr. Wade chiefly has practised the use of the caustic potash at the present time, and has expressed himself very strongly in its favour. He applies it after the mode recommended by Whateley, which has been already fully described, but in larger quantities, varying, according to circumstances, from an eighth of a grain to one grain, most commonly employing about a sixth for the purpose. He regards it as a remedy for almost all varieties of stricture, except the mildest, and hesitates to employ any other measures with an "impassable" obstruction, unless after many trials he fails to get through it. For cases in which there is extreme irritability of the urethra, or where great disposition to contract appears on the cessation of treatment, he recommends the potassa fusa as peculiarly adapted.

Mr. Henry Smith has recently written in favour of employing it in some cases as an adjunct to dilatation, but his estimate of its value is much lower than that of Mr. Wade, while his method of applying it is the same. He reserves it, first, for those cases in which he fails to pass any instrument at all; when he applies it to the seat of obstruction, taking great care lest this should be a false passage, as the application to this instead of to the stricture would be a very serious matter, and it is, he states, "an accident very likely to happen."* And secondly, for those in which he succeeds in passing an instrument through the stricture, but in which, "dilatation cannot be carried on with any degree of satisfaction or certainty;" as well as for some cases of "inveterate stricture complicated with fistula and concomitant induration of the surrounding parts." For the majority of such cases, however, he does not advocate its use, believing that

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* "Stricture of the Urethra." London, 1857. Pp. 129, 134, 154.

"the knife, and that only, will effectually remedy" them. And his advocacy appears to be somewhat qualified by the closing paragraph relating to the subject. "Above all things," writes Mr. Smith, "it is necessary to bear in mind that caustic, and especially potassa fusa, is not to be used without *extreme caution*, either, indeed, as regards its actual application, or the selection of the cases for its employment."

Besides these methods of applying caustic to a stricture, there are no others of any importance. All may be resolved into the two following categories. Either a small instrument containing it is introduced into the stricture, which is not then generally a very narrow one; or a small portion of the agent is carried down to it, and pressed against its anterior surface.

In considering the merits of these systems, it will be obvious enough that it is very difficult indeed to obtain the data which are required, in order to enable us to form an opinion of any value respecting them. As we have no means of acquiring an ocular demonstration of the effects of the caustic upon the spot to which it is applied, and as it is confessedly a difficult, nay, almost impossible, thing, to indicate accurately that spot before doing so; or afterwards, to say positively what extent of application has been made; and as, moreover, its very use involves that of dilatation also, already seen to be an agent of the greatest value in the treatment of stricture, any conclusions drawn from the results of such treatment, unless the opportunity of prosecuting extensive researches for the sake of comparison were afforded, may be exceedingly fallacious. Nothing is easier than to form statistical tables from the journals or elsewhere, of cases treated on different principles by different operators, each probably reporting his cases for the sake of advocating *exclusively* his own peculiar method, whatever it may be. But such data are sometimes deceptive, not from the presence of any intentional errors in these records, but because a certain predilection or bias in favour of a special mode of treatment on the part of the writer, is the cause of his reporting them. The only way to ascertain what are the real results of treatment, is to devote extensive opportunities of practice, systematically, to the employment of two or more methods, the researches to be conducted by unbiassed persons, whose aim it will be to afford the same amount of manual dexterity to the one as to the other operation. For it is evident, that if one operator follow only the cauterizing method, and another only dilatation, the difference in results may be wholly due to unequal dexterity on the part of the two.

The comparison here spoken of, however, is perhaps not within the power of one man to make, nor could it be adequately obtained, except by some system of combination, set on foot for the purpose. Any less extensive or efficient mode of prosecuting the inquiry, would probably not lead to accurate results, and would therefore be worse than useless. Meantime, such evidence as that which has been so ingenuously given by Mr. Phillips, see page 224, is most valuable. Perhaps it would be impossible, under the circumstances, to obtain information respecting this subject, upon which greater reliance could be placed.

In default, then, of possessing such data at present, it is desirable to seek evidence by some means, respecting the effects on mucous membranes especially, of the agents used as caustics. With these views, I have been led to make comparative experiments on the respective actions of the nitrate of silver and caustic potash, on other tracts of those membranes, where the results are easily marked by the eye; and although not perhaps possessing any great value, still the comparison, it is believed, will be a small contribution towards progress in our acquaintance with their effects, and will afford, by analogy, some insight into their mode of action, when applied to parts of the same membrane, which are beyond the scope of vision.

The nitrate of silver and the caustic potash are widely different, not only in composition, but, as is well known, in the intensity of their actions when applied to organized tissues, those being, primarily, of a chemical, but, secondarily, of a vital character. Let a piece of the solid nitrate be pressed, for twenty or thirty seconds, against a portion of mucous membrane, situated where its effects may be viewed (the inner side of the cheek within an inch of the lip is a good place for the purpose). Immediately on its removal a white impression is seen, caused by the coagulation of the albuminous matters in contact; this, a mere film at first, evidently grows denser and whiter during a period of two or three minutes, as if by imbibition of the salt in solution, caused by the presence of moisture, and at the lower side the film spreads from the effect of gravitation. The spot is perceptibly elevated above the surrounding surface. At present no pain is felt. In less than ten minutes it has acquired a pale greenish hue, and in an hour or two it is evident that the raised part is a thin detached layer of the epithelial portion of the mucous membrane, with a small quantity of fluid beneath. A very slight smarting may or may not now have been felt. In twenty-four hours the sloughy film begins to wear away, and a whitish surface, with a red margin, evidently a small granulating sore, appears beneath. In forty-eight hours the slough has totally disappeared, the sore is smaller, and slightly depressed. In seventy-two hours the sore is reduced to a point, there is the same depression, and faint radiating lines converging to the centre, mark a degree of contraction around. Traces of these latter appearances are observable on the sixth day after.

The caustic potash was recommended by Mr. Whateley to be used in quantities not exceeding the twelfth of a grain, and it has been frequently remarked by those who have had no experience of its powers, that any results from the application of such minute portions must be wholly inappreciable, and that any good effects from the treatment must be therefore wholly due to the dilatation, which is practised at the same time. This is not necessarily true. Nothing, however, is easier than to determine the question practically in a similar manner to that pursued with the former agent. Take a piece of fresh and dry caustic potash, and weigh a grain. Many persons would, perhaps, be surprised to see how large a portion this appears to be, considering the potent character of the substance. Break it into fragments, and select one which weighs the twelfth of a grain. Arm a bougie with it, and apply it for thirty seconds to the mucous membrane of the cheek with a fair amount of pressure: an acute burning pain is instantly felt, and on removing the instrument a white spot is seen rather larger than the piece of potash used, and the pain ceases: it gradually becomes black, and in three or four minutes is completely so; and now a little extravasation of blood is seen beneath the epithelium around, while the black spot, increasing its dimensions, has become about the size of a split pea. On examining the bougie, not one-third of the potash is found to be dissolved. An hour after, a greyish slough is seen of the size just indicated, and the mucous membrane surrounding it is swelled and reddened. Twenty-four hours after, the slough is rather larger than at last report, is yellowish in colour, and at the centre of it a very small deep hole exists, indicating the point at which the caustic has acted most energetically. The parts around are still somewhat inflamed, and are tender. Forty-eight hours after, the slough remains as before, but more depressed beneath the level of the surrounding surface—inflammation around subsiding. Seventy-two hours,—much of the slough has worn away by degrees, and the depression is more marked, a cavity existing about the sixteenth of an inch in depth. The margins are still thickened but not tender. Five days after,—the cavity is contracting laterally, but it appears as deep as before, and there is some thickening of the margins. Seven days after,—the cavity is reduced in size; the edges are still a little elevated above the surrounding surface. Fourteen days after,—the depression is very obvious, as is also the thickening around, although less evident than at last report. I am free to confess that I was not prepared to witness results so active and enduring from the use of a portion of potash, certainly weighing less than the thirty-sixth part of a grain. These observations have been accurately recorded, and in both instances have been tested by a repetition of the experiment.

There is one point on which almost all observers are agreed, viz., that the nitrate of silver has no power to destroy a long and narrow stricture, and if it should be contended that the caustic potash is sufficiently active to accomplish the purpose, I think few would advisedly undertake to afford a practical proof of its powers. There could be no hesitation as to the propriety of characterizing such a proceeding as dangerous and inexpedient in the extreme.

In proof of the former assertion, it should not be forgotten that its warmest advocates have not hesitated to record their conviction of its inutility, to say no more, in such cases. Hunter's opinion has been already quoted (p. 221). Home, who used caustic more readily, heroically, and pertinaciously than any man, states that some cases "require a greater degree of perseverance on the part of the surgeon, and a longer attendance on the part of the patient, for the accomplishment of a cure than are often to be met with." He then states that twelve cases have come under his notice which have not been removed by the caustic, and refers to a certain chapter in the second volume of his work for a more particular account of those cases in which "the patients declined perseverance in the mode of treatment;" and he finally "regrets that we have not a more active caustic," since "when the stricture becomes ligamentous, or almost cartilaginous, the lunar caustic makes *less impression upon it than could be imagined from any preconceived opinion on the subject.*"*

Can a more complete refutation of the idea that the nitrate of silver is a remedy for the worst forms of stricture be found than in these words? But let us for a moment turn to the cases in which the want of perseverance on the part of the patient was so unfortunate for himself and disappointing to the operator. The history of the last case recorded (of which a long account is given) is summed up by the author with the information, that during six years the caustic was passed 486 times, after which the patient continued free from relapse, but was "*under the necessity of passing a bougie daily, and leaving it in the urethra for half an hour to keep the canal in a state of tranquillity!*"† Other instances of a similar kind are to be found, exemplifying the influence of nitrate of silver upon obstinate strictures, and need not be quoted here. But I cannot resist a reference to the chapter on "Difficult Strictures cured by Perseverance," where an illustration is brought forward in the form of a history, which is described as "a case of stricture requiring twenty-two years for cure." And in the next chapter follows a case in which the patient placed himself under Sir E. Home's care, in the year 1800, and had the caustic applied 233 times during the subsequent eighteen months. After this he continued under treatment for certain periods during every year until 1815, on the 8th of May in which year a bougie first entered the bladder, the caustic having been applied 1258 times! These, let it be understood, are from the successful cases.

Sir Charles Bell, who also advocated the use of caustic, considered it unfitted for strictures "above half an inch in length."

Sir B. Brodie and Mr. Guthrie also enunciated similar views, and have rarely used caustics in their practice.

What then are the benefits resulting from the use of caustics, and for what cases is their employment indicated?

The nitrate of silver may be useful in a very limited number of cases. It has been found to relieve irritable conditions of the urethra, and blunt the sensibility of the stricture and diseased parts about it if applied in moderate quantity. Thus it may be occasionally a useful adjunct to dilatation, because when undue irritability has been lessened or subdued, the urethra will often admit a sound which could not be passed before; and further, the pain and difficulty in micturition are in the same manner diminished, so that the patient may sometimes be enabled to make a larger stream of urine in consequence of a very light application. Too freely employed it excites more or less inflammation, which may extend and become dangerous primarily; or, by its results, either in the form of increased induration, or by giving rise to abscess. It may thus also cause retention, or profuse hæmorrhage, or an attack of rigors, or it may be the means of creating a false passage. On the other hand, when there is a congested or hæmorrhagic condition of the mucous membrane, a slight application tends greatly to check it. But in both these classes of cases I believe that its application in the form of ointment or solution, applied through a canula perforated at the end, is often quite as efficient, and sometimes more so, than in that of the solid form, especially when the design is to allay inordinate sensibility. We thus ensure a milder form of the remedy and avoid the dangers described.*

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* "Stricture of the Urethra," vol. i. p. 524.

† Vol. ii. p. 113.

The potassa fusa is unquestionably a much more active escharotic than the preceding, and when required, I do not hesitate to say, should never be used in larger quantities than those in which Mr. Whateley advised it. His method of application should be adopted also, inasmuch as it tends to dissolve the salt and to bring the solution into contact with the interior or surface of the stricture. Mr. Whateley reprobated its employment as an escharotic, and contended that the benefit arose from a solvent agency exerted upon the structures in contact with it. I do not hesitate to pronounce a similar opinion, and believe that it may possess a certain power to loosen and dissolve the tough fibrous tissue of some strictures. To the accomplishment of this object its employment should be limited, and any extension beyond this must be considered unwise and dangerous, inasmuch as its escharotic action is necessarily accompanied by considerable inflammatory thickening of the parts around, a condition which it is certainly desirable to avoid.

Sloughing, then, ought assuredly not to be induced, and any evidence of such occurrence following its use should be looked upon as that of an error or mischance. Some strictures there are which appear to become patent more rapidly under its influence than when treated by the sound alone, and in which, therefore, it may facilitate the subsequent dilatation, probably from the influence just referred to.

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* Mr. Guthrie recommended the first-named method, and the following formula:—Ten grains of finely-powdered nitrate of silver, rubbed carefully up with one dram of the unguentum cetacei, and fifteen minims of the liquor plumbi diacetatis. Op. cit., p. 82.

Lastly, it cannot be said that the affected portion of the canal exhibits less tendency to contract after this treatment than after any other, and the same subsequent precaution is necessary after reduction has been accomplished in the majority of cases which have been severe or obstinate, viz. to pass a sound occasionally in order to maintain the adequate patency of the canal. Indeed, if the applications of caustic have occasioned loss of substance, there can be no doubt but that cicatrization of the wounded surface, together with the consequent thickening and condensation of adjacent tissues, will increase the necessity for dilating treatment after.

The conclusions, which a consideration of the evidence which is possessed in relation to this subject enables me to arrive at, are as follows:—

That these agents are never to be employed for the sake of their escharotic or caustic powers, properly speaking.

That the nitrate of silver, lightly applied, may exert a salutary action on the diseased surface of the urethra, relieving inordinate irritability, and checking undue vascularity and disposition to hæmorrhage, as it does in similar conditions of the skin and mucous membrane in other parts of the body, and thus may become a useful adjunct to dilatation.

That the potassa fusa, as a caustic, is considerably more active than the preceding, and is therefore more dangerous of application. If used at all, it should be only in *very minute quantities*, such as fractional parts of a grain, inasmuch as it is exceedingly difficult to limit the action of so powerful an escharotic. It may, perhaps, aid dilatation in the reduction of some strictures, probably by facilitating the solution of some of their component tissues, when care is taken to employ it in obedience to the condition just named.

CHAPTER VIII.

THE TREATMENT OF STRICTURE BY INTERNAL INCISIONS.

The treatment of stricture by incisions—Two methods, internal and external—Internal division—Practice of the older surgeons, history of—Numerous varieties of instruments employed—All act on one of two principles—1. Instruments which cut from before backwards—Objection to some forms—These instruments should have a guide—Method adapted to antescrotal strictures—Manner of employing it—2. Instruments which cut from behind forwards—their superiority—Civiale's urethrotome—His method of employing it—Modifications—Reybard's method—Results—Maisonneuve's instrument—Excision of stricture—Strictures of the orifice of the urethra—Various modes of treatment—Indications for the employment of intra-urethral incisions—Conclusions respecting methods of treatment already considered—Cases.

We arrive at the third method of treatment, viz. the division of strictures by means of cutting instruments.

This is accomplished in two ways, each completely distinct from the other: the first by incisions made altogether within the urethra; the second, by incisions commencing from without, usually in the perineum, and carried into the urethra through the strictured part. The first, or Internal Urethrotomy, will form the subject of this chapter.

Internal Division.—It is not surprising to find that this method should have been put in practice at an early period in the history of the treatment of stricture, since the propriety of making section of the obstruction must frequently have suggested itself to the mind of the surgeon, foiled in his efforts to overcome it by the simple sound.

We have already noticed the practice of Diaz, De Vega, Paré, and others, in the sixteenth and seventeenth centuries, who often combined incisions with the use of escharotics. Chopart speaks of the section within the urethra as adapted to very rare cases of impermeable obstruction when not situated too far back, and quotes Allies, "Traité des Maladies de l'Urètre," Paris, 1755, p. 73, who gives there an account of his having successfully perforated, with a trocar and canula, a stricture which was situated within the glans penis.*

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* "Traité des Maladies des Voies Urinaires." Paris, 1821. Vol. ii. pp. 327, 328.

Dr. Physick, of Philadelphia, employed a lanceted stilette which was protruded from the end of a silver canula, first in 1795, and subsequently, with success, in several cases. His two instruments, one curved, the other straight, are engraved in Dr. Dorsey's "Elements of Surgery."[*] John Bell recommends for a case of long and obstinate stricture, complicated with perineal fistulæ, that the obstruction should be perforated by a "lancet-pointed trocar," in a canula.[†] Sir Charles Bell describes an instrument for cutting from behind forwards, after it had passed through the stricture.[‡] Doerner and Dzondi, in Germany, at the commencement of the present century, used a lancet-shaped knife, sheathed in a tube, for a similar purpose.

Subsequently, Mr. McGhie, of Dumfries, communicated a paper to the "Edinburgh Medical and Surgical Journal," in July, 1823, recommending a method invented by himself, of passing down a wire to the stricture within a canula previously introduced. The end of the wire was free for the space of one inch to enter the contracted part, above which a small instrument was screwed for the purpose of being pushed through it. Engravings of the apparatus are appended to his paper.[§]

In 1827, Mr. Stafford introduced to the notice of the Westminster Medical Society, two instruments which he had designed, one for cutting through impermeable obstructions by projecting forward a lancet blade, the other for ensuring greater accuracy of division for those through which, though narrow, a sound can be passed. "In these instances he introduced a small wire through the urethra into the bladder; on this, and with it as a guide, he introduced a hollow tube with an open extremity to receive the wire, which was slightly curved. This instrument was then passed down to the stricture, and a small lancet was made to project on either side from its extremity, so as to divide the obstruction, being, however, retained by means of the wire in the proper canal."[‖]

Afterwards, in the year 1836, Mr. Stafford published a small work, in which he added the description of a third instrument for the purpose of cutting from behind forwards, while in the act of withdrawal through the stricture.[¶]

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[*] 3rd edition. Philadelphia, 1823. Pp. 155, 170, and plate xix.

[†] "Principles of Surgery," vol. ii. p. 250. London, 1806.

[‡] "Oper. Surgery," vol. i. p. 117. London, 1807.

[§] Vol. xix. 1823. P. 361, *et seq.*

[‖] Report of Medical Society of Westminster.—"Lancet," Dec. 8, 1827, vol. xiii.

[¶] Stafford on "Strictures," &c. London, 1836.

These instruments have been made the basis of many modifications in this country, but the method has been practised much more extensively in France, where numerous forms of urethrotome have been designed: some of these are straight, some curved; some incise laterally, others by the point as the blade is pushed forward, and others as they are withdrawn; and some, the cutting action of which is more limited than that of others, are described as scarifiers.

All may be regarded as belonging to one of two classes. In the first class, the section is made by pushing downwards a lancet-like blade, which may have a slender conducting rod in advance of it or not, into the obstruction to be divided—Incision from before backwards. In the second class, a portion of the instrument containing a small blade sheathed, having been first carried through the stricture, the operator divides it by protruding the blade and drawing it towards himself through the whole of the contracted portion—Incision from behind forwards.

INSTRUMENTS WHICH CUT FROM BEFORE BACKWARDS.—An objection which lies, to a greater or less extent, against most of these instruments, is, that the operator has not the means of judging easily how far, or what he cuts. It is true that so much improvement has been made in some of them, that the power of determining an incision with a considerable degree of accuracy, is attainable. With others the case is widely different. Thus the attempt to perforate an obstruction otherwise impassable, by pushing a pointed blade into it without a guide, must be always hazardous; extremely so, if it be attempted in the curved part of the urethra, for however cautious the operator may be, the blade may be most readily pushed out of the urethra into surrounding structures, and infinite mischief may result. Hence I feel bound unhesitatingly to discountenance the use of all curved instruments constructed on this principle, and if it ever be necessary to apply such an one without a guide (which I never have had occasion to do), its employment should certainly be limited to that part of the urethra which is quite movable, and where its direction can be controlled somewhat by the assistance of the hand not employed in directing the instrument. Less dangerous is it, as we shall hereafter see, to lay open the perineum and divide the stricture from without, thus giving free vent to noxious fluids of all kinds, than to wound at hazard the urethra from within, at or behind the bulb, as we run great risk of doing, when operating at six inches distance from the external meatus, and thus only make a channel for these matters into the erectile cavities and other structures around.

For the section of contractions of the urethra, situated in the movable part of the penis, an instrument of this kind may be applied from within, to remedy those rare cases in which such division in indicated. Generally, however narrow it may be, some dilatation can be accomplished, or an instrument with a slender guide can be introduced, which is much safer; and no fair means therefore should be left untried to effect this object. If, however, the operator fails after repeated attempts, an incision of limited extent may be made on its face or anterior part, which, as Mr. Guthrie has remarked, is that which offers the greatest resistance, especially if there have been much previous instrumental treatment, with the hope and expectation that a small catheter may then be passed, in which case the operation may be completed by means of an instrument which cuts from behind forwards, or by dilatation alone, as circumstances dictate. The preliminary incision requires an instrument similar to that described as Stafford's straight lanceted stilette. This is passed fairly down to the obstruction, when the penis being held firmly in the left hand, the blade is made to protrude in the direction of the canal. Little can be said in favour of adopting any such method, or of the chances of success which it affords, so great is the uncertainty in cutting without a guide of any kind, and so much may be done to render permeable the most obstinate stricture by patient and persevering efforts with fine bougies.

This being accomplished to any extent, a guide of slender size can be made to precede the blade. I have employed in such cases an instrument so constructed as to prevent all possibility of the blade leaving the urethra, however it may be used. (See fig. 18.)

There is a guide, *a*, which projects beyond the canula, of which, however, it forms a part, having a slit in it, through which the blade moves. This extremity of the instrument should constitute a separate portion, and screw firmly upon the canula. It should be formed of steel, and not of silver, like the rest of the canula, because in the latter case it cannot be made so small as a No. 1 or 2 catheter without being unduly flexible, and thus becoming liable to bend so much in use as to interfere with the free passage of the blade through it. In steel it can be made of the size of No. 2, tapering to No. 1 at the point. The extent to which the blade protrudes forward is exactly regulated by a nut, *b*, which screws on the handle: this arrangement being previously made according to the discretion of the operator, the guide is passed through the obstruction, and pressure is made on the handle, which forces the blade from the canula to the required distance, and causes it to cut in depth about one-tenth of an inch on either side of the guide. It retreats into the canula by means of a spring in the handle when the pressure is removed. Before making the incision, however, the strictured part should be steadied by the finger and thumb of the left hand, that the parts may be closely applied to the cutting instrument, and not be pushed away instead of being divided by the protruding blade. If the incision thus made be insufficient, an instrument which cuts from behind forwards, may now be introduced through the contracted portion and the necessary division effected.

In the first edition I described a modification of this instrument (fig. 19), for the

FIG. 18.

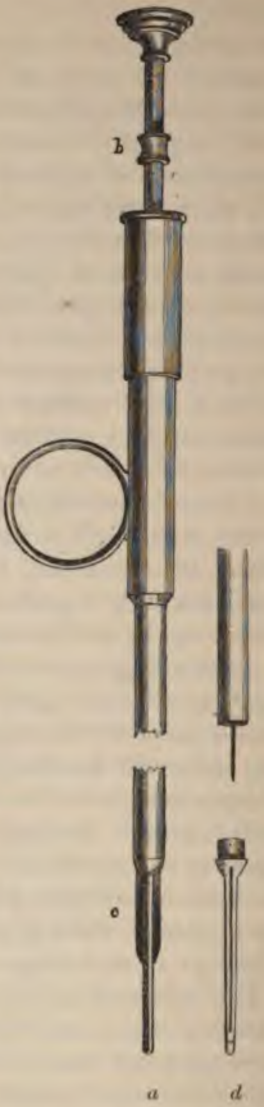

FIG. 19.

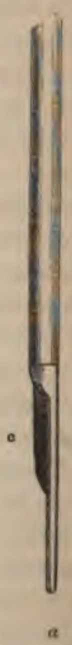

FIG. 18.—Cutting instrument with a guide; *a*, the guide; *b*, nut on the handle which regulates the distance to which the blade protrudes; *c*, the blade; *d*, side view of the same, the steel end detached, showing the slit.

FIG. 19.—Similar instrument for cutting laterally; *a*, the guide; *c*, blade.

purpose of cutting on one side of the urethra only, for cases in which such a section is preferable, which possesses all the advantages of that just described. It is used precisely in the same manner as the latter. An instrument very similar to this is employed by M. Ricord: the only difference is, that his blade is rather wider and requires therefore a projecting portion in order to sheath it. The grooved director in advance of the knife, and the position of the latter are the same.* Recently, I have added another modification. The grooved director is made longer, curved, and hollow like a catheter, and the channel being continued throughout the instrument, with a small stop-cock at the end, the urine may be drawn off through it, and the safe position of the instrument in the bladder verified. The projecting part is made to rest firmly against the obstruction, when, by pressing the handle, the blade divides it. Another addition is that by means of a simple arrangement, which need not be described, the blade may also be made more or less salient at the will of the operator (fig. 20). This instrument is applicable to strictures at the subpubic curve, whenever section from before backwards is required in that situation. When a stricture there, for example, cannot be dilated sufficiently to admit an instrument which cuts from behind forwards, and there are reasons for not performing external division; in such a case it may be done with the

FIG. 20.

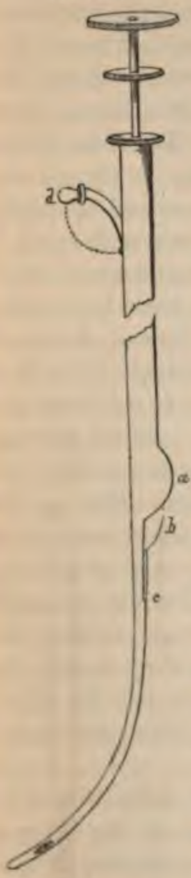

FIG. 20.—Instrument with hollow guide, to incise from before backwards.

a, the bulb, which rests against the face of the stricture. The part below this is the size of No. 3 catheter.

b, the blade partly exposed.

c, the extent to which the blade can be pushed. Just below this point the curve commences.

d, the exit for urine, which flows through this instrument as through a catheter.

By means of the second ring on the handle, the blade can be rendered also more or less salient, as well as be pushed along the groove.

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* Drawn and described in "Lancet," Jan. 12, 1856.

curved urethrotome just described. Or we may adopt another mode; a No. 1 catheter being passed into the bladder, it may form a guide over which a urethrotome can be slipped with ease and certainty, and the same result effected. I had such an instrument constructed some time ago for a patient which need not be described here. But cases requiring this treatment are rare; and experience shows that the incision from behind forwards is, at the sub-pubic curve, much less likely to be followed by abscess or infiltration than is the former method; the urethral walls, also, are divided more evenly and certainly—results similar to those met with in the external operation. As a rule, incision from before backwards, when necessary at all, is applicable chiefly to those narrow and obstinate contractions, which affect the antescrotal urethra. They are generally found between 2½ and 3½ inches from the meatus, and are usually formed of a small ring of indurated tissue, which is remarkably undilatable. For their *cure*, section is almost always necessary, and it may be either internal or external. The former is the less severe method; external incisions anterior to the scrotum are also sometimes rather slow to heal, and give rise occasionally to obstinate fistulous openings. This appears to be due in part to the tenuity of the urethral coverings here, which are in consequence incapable of furnishing a large crop of granulations; and in part to the pendant position of the organ, the angle caused by which just anterior to the scrotum tends to keep the margins of the wound separate. By maintaining the patient in the horizontal position and taking due care to approximate the edges, we may often overcome the obstacle referred to. This confinement, however, is unnecessary with the internal method.

These antescrotal strictures may be sometimes easily divided by means of the instrument for incising contractions of the external meatus, which will be described at the close of the chapter; this, or any other mode of incision from behind forward, is of course preferable to the method now under consideration when the calibre of the stricture will admit of its application. Whatever be the method adopted, a catheter is to be passed after the operation into the bladder, the size being not less than No. 9 or 10, and retained there twenty-four or thirty-six hours, while the patient is to remain quiet in bed. This prevents the contact of urine with the incised part until lymph has been effused to sheath the wound, and so protect it from irritation, and perhaps a fit of rigors, by no means an uncommon occurrence if this precaution be neglected, or even a severe attack of urethral fever; accidents always liable to follow any injury inflicted upon the urethra, but the chances of which are diminished if care be taken that the urine does not pass over the newly-cut surface. After that time the instrument is withdrawn, and in two days should be introduced, a process to be repeated subsequently every other day during two or three weeks, at least, to prevent union by adhesion, and to stretch the newly-formed tissue which intervenes between the margins of the incision: after this at longer intervals during another month.

INSTRUMENTS TO CUT FROM BEHIND FORWARDS.—Of the second class of instruments, viz. those which, being first passed through a stricture, are made to cut in the act of withdrawal, a larger variety is presented to our notice.

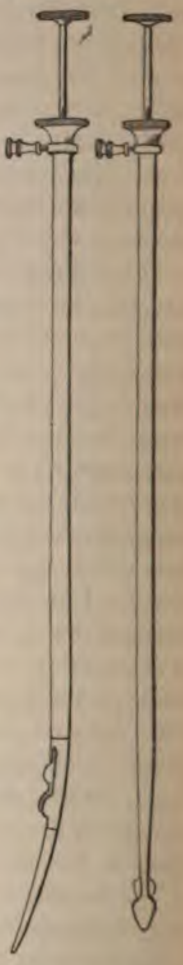
This principle of construction being adopted by almost all those who employ internal urethrotomy, a mode of practice largely pursued by continental surgeons, the forms in use are very numerous, since each operator of celebrity has made some modification to meet his own personal taste or convenience. Hence a long series of urethrotomes and scarificators; instruments for long incisions and short ones, for deep and superficial, for single and multiple incisions; instruments fitted with apparatus for rendering the urethra tense and immovable at the moment when the blade penetrates, so as to ensure a sufficient section; some in which the blade moves freely in the sheath of the instrument, and others in which the instrument itself must be drawn outwards in order to make the incision. Some are straight, others curved; some have flexible points, others are entirely rigid. Some are fitted with two or more blades, most have only one. Any of these instruments may be provided with a bulbous extremity, within which, when it exists, the blade usually lies concealed, so that it may be used as a bulbous sound, for the purpose of indicating the position of the stricture; and its utility is so great that none of them ought to be without it.

The superiority of this class of instruments over the preceding, for general use, is obvious, inasmuch as the principle of construction offers a security to the operator that he is cutting strictly in the line of the urethra. Thus they may be used with safety in any part of the canal; anterior or posterior. There is one drawback, however, that it is a necessary preliminary to their employment, that the stricture should be capable of admitting at least a sound of the size of No. 3 or 4; otherwise of course the urethrotome cannot be passed through it. For most strictures therefore some antecedent dilatation is necessary. This, however, is an objection more apparent than real. We should not forget that the indication for a cutting operation *is not the small calibre of the contraction, but its non-dilatability*. A stricture may be extremely narrow, may not admit even a No. 1 bougie at the commencement of our treatment, but may nevertheless be easily and quickly dilated to the natural size. On the other hand it is no less certain that a stricture may habitually admit a No. 4 or 5 bougie, yet it may be productive of grave symptoms, and may be not at all, or but very slightly, amenable to dilatation, however carefully and perseveringly employed. Such especially are the cases, exceptional it is true, which require division by one means or another.

In connection with the employment of internal urethrotomy, it is always desirable, before performing it, to make a correct estimate of the length of the stricture from before backwards, and ascertain on which aspect of the urethra it is most salient, and whether narrowing or induration exists on more than one spot. This is effected without difficulty by using the exploring sound with a bulbous extremity (see fig. 12, page 166), the sensations communicated by which, as it passes tightly through the stricture, when it becomes free on the other side, and as it repasses in withdrawal, enable us to obtain very accurate ideas respecting all these particulars.

Two of the earlier forms of instruments adapted to cut from behind forwards are shown at figs. 21 and 22. During the last few years they have been greatly improved, and now we possess urethrotomes which combine all the qualities necessary for safe and easy use. Among the French sur-

Fig. 21. Fig. 22.



Figs. 21 and 22.—Urethrotomes; from Leroy D'Etiolles on Stricture.

geons of eminence who have paid much attention to their employment, and who have brought them to their present perfection, are the well-known names of Civiale — whose instruments and modes of procedure will be described in detail in the succeeding pages—Leroy d'Etiolles, Sedillot, Mercier, Ricord, Maisonneuve, and Bonnet. The instruments of Reybard, Boinet, and others, are also well known.

Fig. 23.

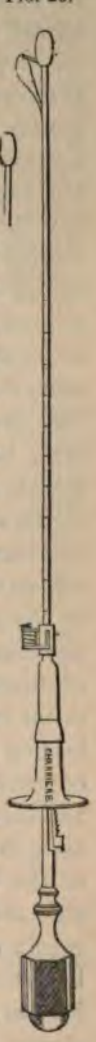


Fig. 23.—Civiale's urethrotome.

After a good deal of personal attention to the subject, and some experience of the methods employed, I am satisfied that internal urethrotomy offers a very successful means of dealing with certain intractable examples of the complaint. Of the various modes of conducting it, one of the best appears to me to be the proceeding adopted by Civiale. His experience has been very large, and has resulted in the plan which he now pursues, full opportunities of studying which I have enjoyed in his own practice, both private and public. The instrument which he employs is represented at fig. 23. The blade lies concealed in the bulbous extremity, from which, by means of a simple contrivance in the upper end of the sheath or canula, it can be made to project one, two, three, or four degrees, according to the depth of the incision intended. His mode of proceeding is as follows:—First, having sufficiently dilated the stricture, so that it will admit about a No. 4 or 5 bougie, he ascertains exactly the situation and extent of the obstruction by means of the urethrotome itself, the bulbous end of which forms a useful sound. He carefully feels whether the projection into the course of the canal is more marked on one side or the other, by gently drawing backwards and forwards on each aspect the bulb of the instrument, in the manner already referred to. Having verified his observation, the bulb is carried about one-third of an inch, or a little more, beyond the stricture, the blade projected, and the incision made by drawing it slowly, but firmly, outwards, that is, in a direction towards the external meatus, to the distance of an inch and a half, or two inches; so as to incise fully the stricture and a little of the sound urethra before and behind it. He is of opinion that in all cases, wherever the stricture is situated, it is better to divide too much than too little; hazard is not increased by extent of the incisions; those which are too deep are, on the contrary, more liable to give rise to abscess or extravasation. If there are two or three strictures in the same urethra, all are divided at the same time. Should there appear a necessity for another incision after a few days' interval, it is repeated; but this is exceptional. After the operation a full-sized elastic or metallic catheter is passed, and retained for twenty-four hours. During the first fortnight a metallic sound is passed about every second day, taking care to press the convexity of the curve well downwards into the site of the wound so as to keep the lips asunder, or, at all events, to extend the cicatrix. After this it is to be used every three days, every four, every week, and at last twice a month. The operation is certainly by no means a painful one, and chloroform is unnecessary except for irritable and sensitive subjects. Civiale says that the existence of much pain in passing sounds in the subsequent dilatation is usually a sign that the division has not been so complete as it should have been. Hæmorrhage, to any serious extent, is exceedingly rare; if it is free, a full-sized instrument in the urethra and external cold will stop it. Febrile symptoms occasionally show themselves after the operation, as in other modes of treatment, and disappear without remedial means. Three times in the course of his experience there has been infiltration of urine, leading to troublesome, but not grave, results. Death has not occurred in his own practice. He regards the procedure as auxiliary to dilatation; to be employed only in those exceptional cases in which it fails; and therefore not very frequently to stricture in the bulbous portion. While, on the other hand, for obstinate stricture in the penile portion of the urethra it is almost always indicated; and always for that which involves the meatus externus, well known to resist obstinately both caustic and dilatation.* I have had an opportunity, through the repeated kindness of M. Civiale, of observing numerous cases so treated, and of several times watching his own performance of the procedure; and this experience, together with that of those cases in which I have followed his method, has led me to believe that we possess in it a very simple, safe, and efficient treatment of many of the most obstinate cases which resist ordinary dilatation. Case IX., at the end of this chapter, in which I performed it, is a good illustration of its value, and of the kind of stricture to which it is well adapted.

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* See also "De l'Urètrotomie," par le Dr. Civiale. Paris, 1849.

FIG. 24.

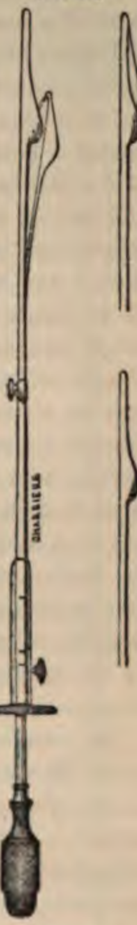

FIG. 24.—Urethrotome; model of Charrière.

The principles of construction, which are essentially necessary to adopt in a urethrotome to be employed from cutting from behind forwards, whatever the minor details which each operator may imagine to suit his own convenience, are, first the power of regulating with precision the extent to which the blade is protruded from the sheath, and its perfect steadiness and solidity in the position required; and secondly, the power of estimating the situation and extent of the stricture by means of the instrument with which the incision is to be made. These qualities are of course to be combined with a calibre as small as is consistent with sufficient strength, and the requisite mechanism.

A slight modification of Civiale's urethrotome has been made by his coadjutor, Dr. Caudmont, which is preferred by some operators. Charrière, the well-known instrument maker, has an ingenious modification also, which enables it to be employed in two ways, from behind and forwards, and from before backwards also (fig. 24).

It is necessary now to notice the proceeding and instrument of M. Reybard, which has attracted some attention since the French Academy of Medicine awarded to that gentleman the Argenteuil prize in the year 1851, and the commission appointed to report upon the merits of the various competitors, applied to M. Reybard's essay terms of high commendation.

M. Reybard starts by assuming that no stricture whatever, whether slight or considerable, old or recent, can be cured by dilatation, and that the employment of bougies or sounds for this purpose is to be regarded as merely subservient to that of incisions, on the plan recommended by himself, and which he claims to be, of all others, "the only curative treatment of stricture."* The practice of his method is conducted as follows:—

Having passed a sound through the stricture, and dilated it, until it will admit with tolerable ease an instrument of the size of No. 9 or 10 of our scale, he passes through it his urethrotome, which carries a blade about an inch in length, so as to divide the whole of the stricture, together with the urethral walls, for an inch behind and an inch before it, making usually a wound about three inches in length, and of very considerable depth. He advises that the blade should then be thrust backwards and forwards three or four times, so as to ensure the effectual division of the tissues, both in respect of length and depth. The hæmorrhage, which is frequently considerable, is to be arrested, if necessary, by passing down to the incised portion of the urethra a hollow bag of caoutchouc, rolled into the form of a bougie, and capable of being inflated with air or water while *in situ*. The subsequent treatment consists in passing a full-sized bougie, or some special dilating instrument, twice a day on not less than thirty or forty consecutive days, in order to maintain apart the borders of the wound in the urethra, to prevent union by the first intention, and ensure the production of granulations, which shall afterwards constitute a long "intermediate cicatrix," and thus, by the formation of a piece let into the side of the urethra, as it were, produce a permanently enlarged canal.

The urethrotome has also a dilating apparatus attached to its sides, consisting of two thin flat rods of spring-tempered steel, which can be made to project and dilate the urethra by a very ingenious mechanism, in order to stretch the mucous membrane before commencing the incision, and so ensure its complete accomplishment, in case the contraction is not sufficiently narrow to grasp and steady the instrument in its place. The size of the instrument equals No. 9 of our scale, but the action of the appended dilating rod is capable of increasing this enormously. (See fig. 25.)

M. Reybard admits the occurrence in his practice of very serious accidents consecutive to his operation. He describes a case in which he very nearly lost a patient from bleeding into the bladder. Hæmorrhage, to a considerable extent, he regards as a frequent and natural consequence of the operation. It will be considered in England that this is not a circumstance very unlikely to happen, since he advises the section of the contracted part to be directed towards either side of the urethra, and not in the median line along the floor, in order to avoid cutting the artery of the bulb (p. 385). Infiltration of urine he regards as another accident which may occur, although it has not happened more than once in his practice. In order to avoid it, a gum catheter is to be tied in for the first forty-eight hours. Violent febrile attacks are not infrequent consequences of the operation, but he denies that any objection arises out of the fact, because they are known to occur also after cauterization, and even sometimes after simple dilatation; adding, that he has only lost one case in that way. Considerable infiltration of blood into the cellular tissue of the penis and scrotum, causing great enlargement, has occurred in a considerable number of cases, so much so, as to have been regarded by the author at one time as the necessary and characteristic sign that a sufficient division of the urethra had been made.

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* "Traité Pratique des Rétrécissements, du Canal de l'Urètre," par M. le Dr. Reybard, ouvrage couronné par l'Académie Impériale de Médicine, qui lui décerné en 1852 le grand prix d'Argenteuil. Paris, 1843. P. 205.

FIG. 25.

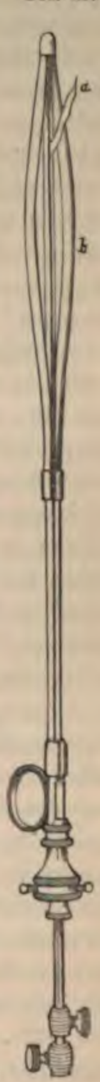

FIG. 25.—Reybard's urethrotome. *a*. blade, *b*. one of the dilating rods.

I ventured to express in the first edition of this work, appearing as it did almost immediately after the announcement of M. Reybard's operation, a conviction that the adoption of a proposal to make such extensive intra-urethral incisions would not be found an improved mode of treatment. Already it appears to have become almost obsolete, if, indeed, this term can be applied to a proceeding which, although it attracted great attention and gained a valuable prize (10,000 francs), was never practised to any great extent.

The details of his own experience, thus briefly analyzed, have, however, been the means of teaching a valuable lesson; viz. the danger which attends deep incisions in internal urethrotomy; no doubt exists now in the minds of those who, having enjoyed fair opportunities of examining the two operations, are competent to judge, that external division, affording as it does free exit for the urine, and for the excretions of the wound, is far safer than the internal operation with *deep* incisions.

More recently still, M. Maisonneuve has proposed to make extended internal incisions by a method which he regards as superior to that of M. Reybard just considered. It was thus described by him in a Memoir presented to the Académie des Sciences, Feb. 13, 1854:—"The instrument which I use is not new . . . . it is simply the lithotome of Frère Jacques, a little modified in length and curve." "In order to practise this operation, the urethra must be first sufficiently dilated in order to admit the instrument."* This is done by means of the filiform bougie and apparatus described at page 199; on the end of this his urethrotome is screwed, and it is then pushed onwards through the stricture, opened, and withdrawn. It is not necessary to enter into details; it may be added, however, that it appears not to have met with much favour in Paris.†

There is still another mode of employing incisions within the urethra for the cure of stricture, which may appropriately be considered in this place. It is that which has been termed the "excision" or "resection" of a stricture. This proceeding was proposed by Dr. James Arnott, in his treatise on stricture, published in 1819, but it does not appear that he had then put it in practice. His design consisted in first passing through the contracted part of the urethra, an instrument, the action of which he thus describes:—"It resembles, in some respects, that of cutting out a portion of the cranium by the trephine; the whole substance forming part of the stricture is instantly removed by one push and turn of a circular knife carried against it."‡ After this, Mr. Phillips proposed an instrument intended to act on the same principle.§ M. Leroy d'Etiolles has recently revived this practice, otherwise it would not have been mentioned here. He has referred to it at various times since 1838, but lately read a paper at the Académie de Médicine (August 14, 1855), advocating the treatment in some cases. The following is the principle on which he endeavours to show that this expedient is desirable. He says, "Fibrous contractile strictures, obstinately resisting methodical dilatation, ought to be regarded as similar to vicious cicatrices on the surface of the body, to be treated as these; it is therefore *necessary to cut them wholly out*."[*]

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* "Comptes Rendus." 1854. P. 302.

† See repeated discussions on Maisonneuve's paper on the subject at the Société de Chirurgie; May, 1855; "Bulletin," tome v. pp. 420–431.

‡ Pp. 155, 156.

§ Phillips on "Stricture," pp. 221–223.

Can it be possible to overlook two fatal objections to the practice of this project? First, that the deposit in confirmed stricture exists far beyond the limits of the diameter of the urethra, involving a considerable portion of the corpus spongiosum itself, and therefore cannot be removed by any such trephining apparatus; secondly, that the wound thus made, removing as it does the mucous membrane, must inevitably be followed by the production of a true cicatrix, which, on the very theory above named, must be regarded as liable to produce one of the very worst forms of stricture met with, viz. that of traumatic origin, in place of the one removed.

NARROWING OF THE EXTERNAL MEATUS.—It is by no means uncommon to meet with stricture at, or very near to, the orifice of the urethra. It may be congenital; the result of inflammation; of cicatrization after chancre, or other lesion there. It may be the only obstruction in the canal, and yet give rise to the most painful and serious symptoms, and even to a fatal result: a case of the last-named kind has been already alluded to. I have given complete relief to distressing symptoms of very long continuance, the cause of which was not suspected, by dividing an external meatus, which admitted nevertheless a No. 6 catheter. I have met with three marked examples of a similar kind, in which the very simple operation necessary was followed by complete disappearance of urinary difficulties, which had been long regarded as of an extremely obscure character. When the contraction is much narrower, as it more frequently is, the cause is obvious enough, and is seldom overlooked; but those of the nature just referred to, it is important for the surgeon to bear in mind. The sides of the orifice in these cases appear to be remarkably elastic; so that, although a No. 6 or even No. 7 bougie may be passed, the opening is far short of that calibre in its ordinary condition.

All these constrictions of the orifice are remarkably obstinate, and, generally speaking, dilatation is useless, while at the same time it is extremely painful. Incisions also, to be permanently successful,

[*] "L'Union Méd.," Aug. 21, 1855; and more recently M. Leroy has described the proceeding, as well at that of the division of stricture by the "écrasement linéaire;" "Bull. de l'Acad. de Med. de Belg." 1858, tome i. No. 2, p. 77.

must be free. It may be performed with a director, and a straight, narrow-bladed bistoury; but the most efficient mode is a little instrument employed by Civiale, which is more certain and rapid in its action than any other (fig. 26). It consists of a very small *bistouri caché*, which is passed through the contracted part of the canal; pressure being made on the handle, and the blade thus opened to an extent previously determined and arranged by means of the screw, it is instantly drawn out, and the section is made. It is necessary only to take care that the edge is turned directly downwards, that is, towards the frænum. A piece of dry lint, rolled up to the size of about No. 12 or 14 bougie, and introduced for an inch and left there, stops the bleeding, and may be exchanged for a similar plug of oiled lint after a few hours. After a day or two, the patient may introduce for himself a short conical metal bougie, about three inches long, and provided with a handle sufficiently large to prevent the possibility of its slipping altogether into the urethra. If division is not free, adhesion of the sides is apt to occur, and more or less narrowing return; the consecutive dilatation must also be maintained for four or six weeks. It is impossible to offer a better illustration of the benefit which often results from this little operation than is afforded by Case X., at the close of this chapter.

FIG. 26.

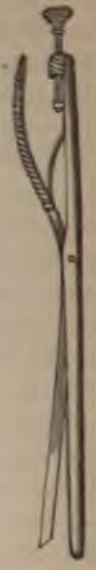

FIG. 26.—Civiale's instrument for stricture at or near meatus.

Mr. Fergusson also treats these contractions, and sometimes those which are more deeply situated, by means of an instrument consisting of a straight director, and a narrow blade sufficiently slender to be passed along the groove.* He expresses himself as extremely well satisfied with the results.

The late Mr. Colles, of Dublin, adopted a method of treating these cases, which proved very successful in his hands, and which, therefore, deserves notice. It has also been employed by Mr. Williams, of that city, who speaks most favourably of the results in three instances in which he has performed it. Respecting one of these, reported in the "Dublin Medical Press," twelve years ago,* Mr. Williams has been kind enough to inform me that he has recently seen the patient, and finds the urethral orifice perfectly free from contraction. Mr. Colles thus describes the proceeding. After stating that the stricture which follows chancrous sores of the meatus is of all varieties one of the least amenable to treatment, he writes: "Having detached the skin (of the prepuce) from the end of the urethra to which it is generally intimately adherent, I divide the urethra below to the length of more than half an inch. I raise the mucous membrane from each lip of the incision, then cut away a portion of the bared corpus spongiosum to such an extent as will allow the raised mucous membrane to cover the cut edge. I stitch down this membrane upon the corpus spongiosum, and thus, having covered each lip of the wound by mucous membrane, I have effectually guarded against the possibility of reunion of the lips of the wound, or subsequent contraction of the opening. The opening of the urethra thus produced is of course of a size larger than natural."†

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* "Practical Surgery," 4th edition, Lond. 1857, p. 778.

Congenital contractions vary much in degree; frequently existing to a slight extent and requiring no treatment, although it is sometimes necessary to divide them in order to pass an instrument for the treatment of an acquired stricture. It is common also to find congenital narrowing at about half or three-quarters of an inch down the urethra; but the obstruction is generally little more than a membrane, stretching partially across the canal. It may be treated by division with the instrument just described.

The following conclusions will form a summary of the present chapter:—

INTERNAL URETHROTOMY is indicated in almost all strictures affecting the external meatus of the urethra; and in many cases of stricture situated about the middle of the spongy portion, for which dilatation, fairly tried, has proved unsuccessful.

It is useful, also, in some few cases of stricture situated at the bulbous portion, which are not relievable by dilatation; a single incision, which is not deep, being free from danger, and frequently rendering the stricture perfectly amenable to dilatation afterwards.

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* "Dublin Medical Press," April 28, 1841. Vol. v. pp. 255–260. The method adopted by Ricord of Paris and Weber of Bonn differs a little in detail, but is the same in principle. "Bull. de Thérap.," vol. xlix. 1855. P. 333.

† "Practical Observations on the Venereal Disease," &c. London, 1837. Pp. 94, 95.

Lastly, it is so in those rare cases in which the urethra is narrowed and indurated at many points, or throughout a great portion of its course, dilatation having been found inefficient.

That in all cases where it is possible, the operation should be performed by means of an instrument which cuts from behind forwards; and that those instruments which cut from before backwards should, as a rule, always have a guide in advance of the blade.

But let it always be remembered that no absolute rules can be given to include every individual case; it is, therefore, impossible to define strictly the line to be drawn between cases for which the operation is fitted, and those for which it is not. It may be quite possible to find an exception to each one of them. Taking the foregoing not as absolute rules, but as indications, the surgeon must never forego reliance upon the careful exercise of his own judgment in each individual case.

Let us now briefly sum up the conclusions at which we have arrived up to this point of our progress.

DILATATION has been found successful for the great majority of cases, but certainly inefficient for the cure of some old and extensive strictures, as well as for some which are accompanied by a highly irritable condition of the urethra.

CAUTERIZATION may perhaps be regarded as a useful adjunct to dilatation in some few cases, especially in some of those in which a considerable degree of irritability exists. It is wholly inapplicable to the removal of old and extensive contractions.

INTERNAL DIVISION is adapted mainly to cases where the stricture is situated in the anterior part of the urethra; less frequently to those of the posterior portion.

There remain some few cases of very narrow stricture, in which the presence of extreme irritability precludes dilatation (which is also the necessary preliminary to the best form of internal division, that from behind forwards); and there are other cases in which the morbid induration is too considerable to be divided by any incisions which are safely practicable by the internal method. For these exceptional cases an adequate remedy is yet to be described.

Case IX.

Stricture remarkably contractile, of long standing—Dilatation of little service—Internal division completely successful.

C. P., a gentleman, æt. 42.—Consulted me for a long-standing stricture of the urethra, April, 1857. It is unnecessary to detail the history, which is long, as he had been subjected to much treatment, the effects of which had been beneficial, but extremely evanescent.

April 3.—With the bulbous sound I found an annular stricture, admitting No. 4, at four inches' distance from the external meatus. A little ring of induration was readily felt in that situation when the catheter was in the canal. The patient desired more permanent benefit than dilatation had hitherto afforded him, and came to me for that purpose.

April 10.—Having previously dilated the urethra to No. 6, I passed Civiale's urethrotome (see p. 243) through the stricture, and made a single division along the floor about an inch long, which was ample to divide fully the stricture and some of the sound canal before and behind. I immediately passed No. 10 silver catheter into the bladder, and tied it in for twenty-four hours. About a drachm of blood was lost at the operation. The patient said that the pain was very slight, much less than he had anticipated.

April 11.—I removed the catheter; patient felt perfectly well.

April 12.—I passed Nos. 9 and 10 with ease.

April 14.—He came to me, and the same instruments were passed.

April 28.—Nos. 10, 11, and 12 have been passed with ease every other day. He passes water in a full stream, and is free from any symptoms of stricture.

May. 7.—He left my care, having learned to pass No. 10 conical steel sound for himself, which I advised him to do once every four days, then every five, and, finally, once a week, for a few months.

April, 1858.—He writes me that he prefers to pass his instrument still every seven or ten days, and that he is perfectly well.

Case X.

Stricture at external meatus, following chancre—Severe and long-continued symptoms—Internal division affording a perfect cure.

J. J., æt. 34.—A gentleman, whom I visited at the request of his medical attendant, in the spring of 1857, had been suffering from painful, prolonged, and frequent micturition for five years past. He was compelled to pass water from three to five times every night, and every two hours during the day; experienced severe pains in the back and loins, and general ill-health. Urine was purulent, fœtid, alkaline; results of habitual retention and partial engorgement of the bladder. He had been treated for renal disease, without any good effect.

On examination, I found simple narrowing of the urethral orifice, and marks of previous ulceration in a small cicatrix. I learned that he had had chancre seven years before, which involved a large portion of the meatus, after the healing of which, his present symptoms very slowly, almost imperceptibly, appeared. A probe only passed through the narrow opening. Of course I advised its division.

May 3, 1857.—I slowly dilated the orifice with a small conical sound, then passed the short urethrotome (see p. 250), and divided the contraction, so as to make a free opening. A No. 10 was passed easily into the bladder, demonstrating that there was no other obstruction, and twelve ounces of urine drawn off, although he had passed water just before. The instrument was removed; a plug of lint tightly rolled up, so as to fill the orifice completely; to be taken out at the first act of micturition, and another fixed in its place. Continue for forty-eight hours.

After this he passed every day a short conical sound, No. 10 at the point, No. 14 at the widest part.

The relief was almost instantaneous; in a week it was complete. He has had perfect immunity from trouble or discomfort from his urinary complaints ever since.

CHAPTER IX.

THE TREATMENT OF STRICTURE BY EXTERNAL INCISIONS.

Some cases resist all the methods of treatment hitherto described—Early history of external operations—Wiseman—Solingen—Practice of the older French surgeons—The "boutonnière"—Meaning of the term—External operations by Colot and Tolet—Palfin—Col de Vilars—Operations by J. L. Petit and Ledran—Astruc—Sharp—Chopart and Desault—Operations by John Hunter—Grainger—The Bells—J. M. Arnott—Guthrie—The "perineal section"—Method of performing it—Applicability of the operation—An operation proposed by Mr. Syme—Its design and history—"Impermeable stricture"—The urethra sometimes completely obliterated—Signification of the term "impermeable stricture" discussed—Condition of a stricture affected by slight influences—Nature of Mr. Syme's operation—Cases in which he recommends it—Dilatation failing, external division may be sometimes resorted to—Rationale of its action—The results of experience in relation to the operation—Examination of the fatal cases—Pyæmia the most frequent cause of death—Urethral fever—Other dangers, not of a fatal kind—Hæmorrhage—Evidence respecting its occurrence as a result of the operation—Division of the bulb is a source of hæmorrhage commensurate with its extent, &c.—Method of treating it simple and effectual—Urinary infiltration—Value of the operation as a means of cure—Cases not improved by it—Cases followed by relapse—Causes of relapse enumerated by Mr. Syme—Experience of other operators—Cases permanently cured—Cases for which the operation is adapted—Contra-indications to its performance—Mr. Syme's directions and practice—Practical remarks respecting the performance of the operation—Preliminary measures—Steps of the proceeding—After-treatment—Subcutaneous urethrotomy—An objection to the operation noticed—Concluding remarks—Illustrative cases.

It may be presumed that there are few observers who, having enjoyed sufficient opportunities for forming an opinion, will not acknowledge the truth at all events of the last deduction. Almost all authors of note and experience admit that now and then a case comes under their notice which either resists, or will not admit of ordinary treatment. These, as will be at once understood, are moreover, in the ordinary sense of the term, bad cases; cases in which, if substantial relief be not afforded, the constitution must ere long break down under the painful and dangerous progress which unrelieved organic disease of the urinary organs is certain to make. The necessity for some successful mode of treatment is urgent. Inefficient treatment does not even palliate, it rather increases the mischief. Time is also valuable to such patients, for the unfortunate condition attained is usually the result of some years of suffering, it may be of neglect or bad treatment, and injury to the kidneys may be imminent, or indeed may already have been sustained. It is most desirable therefore that some efficient remedy should be found; permanent relief being, in short, for such patients clearly an extension of life.

HISTORY OF EXTERNAL URETHROTOMY.—Such a conviction has induced the attempt by surgeons to cure obstinate stricture by cutting down upon it in the perineum or scrotum for the purpose of dividing, and even in some instances of excising, the obstructing parts. This is said to have been practised at a very early period, and the writings of Rhazes (tenth century), and of Avicenna (eleventh century) have been quoted as its origin. Both described puncture of the bladder through the perineum for the relief of retention of urine, but nothing more; an operation which differs as widely from division made for the cure of stricture, as it does from the operation of lithotomy. I believe that there is no record of a cutting operation from the external surface of the perineum, performed *for the cure of stricture and not for the relief of retention,* in consequence of failure by dilatation, previous to a period rather more than 200 years ago. Richard Wiseman in his eighth book, on "The ill Consequences of Gonorrhœa," relates that in the year 1652 he assisted that "celebrated chirurgeon, Mr. Edward Molins, in his practice," and details, "one of his operations," performed for the relief of retention, which consisted of an incision "into the urethra near the neck of the bladder." He states that the "knife did not readily divide it, for it was as hard as a gristle." The urine gushed out, and the wound continued fistulous after. Meantime with "probes and candles," the surgeons attempted to find a passage through the urethra, but in vain. Some time after this, at the solicitation of the patient, who appears to have got tired of his perineal fistula, the *whole length, or nearly so, of the urethra was laid open from without by incisions in the middle line,* dividing the scrotum. "The urine, nevertheless, continued to flow by the opening *in perineo.*"*

In the latter part of the same century, a similar operation was performed by a Dutch surgeon named Solingen, who slit up nearly the whole urethra, although solely for the purpose of applying caustics to the carnosities there. The canal was closed by twisted sutures, and the result was described as successful. Solingen is said to have practised this mode before at Livourne.[*]

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* "Chirurg. Treatises." By R. Wiseman, Lond. 1692. vol. ii. pp. 427–8.

The next record, in point of time, is found in the annals of French surgery. As far back as the end of the seventeenth century an operation termed the "boutonnière" was occasionally performed in different forms of urethral obstruction and its results. It consisted in making an opening into any part of the urethra from the external surface, either with or without a grooved staff by which to guide the knife, as circumstances admitted. This was usually done in the middle line, when anterior to the scrotum, and either in the middle or by the side of the raphé when in the perineum. The purposes for which it was employed were various. François Colot, the famous lithotomist, adopted it several times for the purpose of removing calculi impacted in the posterior part of the urethra, for washing out the bladder, to relieve retention of urine, and in very obstinate or impassable stricture when complicated with numerous fistulæ. He relates two cases of the last-named kind, in both of which he thus operated, in the year 1690. A canula was subsequently placed in the bladder, giving exit to the urine by the perineal opening. The urethra was then dilated, and the fistulæ cauterized; ultimately both patients were cured.[†]

François Tolet, the celebrated lithotomist of La Charité, who flourished a little before the time of Colot, has been cited as having performed the operation of external urethrotomy. This, however, he never did for the cure of stricture, only for the relief of retention of urine. He speaks of the boutonnière as performed in his time "by men of great skill and reputation," but only in the emergency named. He passed a grooved staff down to the obstruction in the urethra, and then pushed on a "gorgeret" in the direction of the bladder, replacing it by a canula subsequently. Sometimes he punctured by perineum, using a trochar of his own invention.[‡]

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[*] "Observ. Rar. Med." Cent-post., pars prior. By Stalpart van der Wiel. Leyden, 1727, p. 410.

[†] "Traité de l'Opération de la Taille." Ouvrage Postume. Par F. Colot. Paris, 1727, p. 235. Cases 241, 243.

[‡] "Traité de la Lithotomie." Paris, 5th edition, 1708, chap. xxvi. (The 1st edition appeared in 1681.)

Jean Palfin recommends Colot's method of incising the perineum in cases of bad stricture with fistulæ, as it enabled the surgeon to withdraw the irritating urine by the wound, and to pass, from the external meatus to the perineal opening, a seton (which should be changed daily), so as to dilate all contractions there, and to wash out the bladder if necessary. He says it was frequently practised by Colot, and that he considered it "more certain" than caustic bougies, which are "often only palliative."* Col de Vilars speaks of the practice as useful in retention, but thinks it unadvisable under other circumstances.†

The celebrated J. L. Petit appears, on numerous occasions, to have performed the boutonnière for retention of urine, and in some cases, when possible, he divided the stricture at the same time. He also relates a case in which he applied it for the cure of a stricture, through which neither he nor any other surgeon could pass an instrument, no retention or fistulæ being present. Here he made an incision two inches in length in the perineum, "like that for lithotomy," upon a grooved sound passed down to the obstruction ; and the point of this instrument being then exposed, he pushed a trochar into the bladder, carefully following the supposed course of the urethra. The urine being removed, he withdrew the grooved sound, "and the canula of the trochar served to guide the bistoury so as to cut the strictured part." A catheter was subsequently passed and tied in, upon which the wound cicatrized in a month, and the patient was "perfectly cured." He states that he soon afterwards repeated the operation in almost the same circumstances, and with success ; and he adds, "all those on whom I have done the boutonnière for retention of urine, have regained freedom of the canal, when I comprehended the obstacle itself in the incision."‡ He proposed even to perform it when the urethra was patent, and consequently upon a grooved staff introduced into the bladder, but only under very peculiar circumstances, which he thus describes. Having stated, as a rule, "that the use of the boutonnière is to be shunned whenever the introduction of a sound is practicable ;" he supposes a case of acute inflammation of the bladder, with urethral obstruction, in which an instrument had been passed to draw off the water, but its continued presence could not be tolerated. He would therefore perform the boutonnière upon the sound itself before withdrawing it, lest its re-introduction should be impossible; "in which case," he says, "the operation must be performed without it, a very serious circumstance, since there would be no sound for a guide."[*]

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* "Anat. du Corps Humain." Paris. 1726, 1^{e} parte, cap. xx. p. 174.

† "Cours de Chirurgie.' Paris, 1741, tome iv. p. 221.

‡ "Mémoires de l'Acad. Royale de Chir." Paris, 1743, tome i. part ii. pp. 338–40.

Ledran employed the perineal incision in cases of retention, and occasionally in cases of impassable stricture, with perineal fistulæ; he generally employed the gorget. He details an instance where, in 1730, he made a long and deep incision of the perineum, which was deformed and riddled with fistulous openings. Not succeeding in hitting the urethra, he next day selected one of the fistulæ close to the incision and passed a bougie through it, as far as he could, towards the urethra; but, still failing to find it, he continued daily with this bougie, until on the fifth day he reached the bladder. He then introduced upon this a small grooved staff, and slit open the canal to the neck of the bladder, giving free exit to the urine, and finally substituting for the staff a hollow canula. The course of the urine being thus diverted, the stricture became amenable to dilatation, and the fistulæ healed. He cured the patient, but "advised the use of bougies and a leaden sound in order to preserve the urethra dilated."[†]

Astruc describes the operation as having been lately performed, but regards it as useless and dangerous. The situation of the obstruction having been determined, and a mark to indicate its position having been made on the perineum, he says: "A grooved sound was introduced as far as possible into the urethra, and an incision made from its point on either side of the perineum parallel to the raphé. The part being well exposed to view, caustics or detergents were to be applied to the caruncles or ulcer, supposed to exist there; and when all appeared to be sound, the wound was permitted to heal.[‡] Daran also speaks of the same proceeding, and opposed it.[§]

About this time we find the practice described by Wiseman and Astruc, still in vogue in our own country. Sharp, of Bartholomew's Hospital, tells us, that, on account of the extremely bad results which had followed the use of escharotics in his time, "another kind of process has been established in their place, which, in point of severity, is nearly, if not quite, as exceptionable. This is by cutting *in perinæo*, if possible upon a staff, and then, by the help of a gorget, to introduce a silver canula covered with a fine rag into the bladder, which is to be kept there two or three days, and then withdrawn; after which the obstructions are to be destroyed by proper digestive and escharotick medicines; at the same time, a seton is to be passed from the wound through the urethra, and out at the extremity of the penis; this seton is daily to be covered with either escharotick powder or strong digestives, in order to waste the obstructions of that part; when this is done, a catheter is to be introduced into the bladder and kept there, that the urine running off that way, the wound may more easily heal. When the wound is healed, the catheter must be taken out."[*]

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[*] "Traité des Mal. Chir.," vol. iii. p. 7, ed. nouv. Paris, 1790.

[†] "Traité des Opérations de Chirurgie." H. F. Ledran. Paris, 1742, pp. 368–71.

[‡] "De Morbis Venereis." Joh. Astruc. Paris, 1738, lib. iii. cap. xiv. p. 243.

[§] "Observ. Chirurg." Paris, 1748, p. 101, and elsewhere.

Chopart employed the boutonnière in a case of fistulæ, in 1786; having opened the urethra, he failed to get any instrument through the stricture: the fistulous openings which had previously existed healed, but the wound made by operation remained open, and by this all the urine subsequently passed.[†] Sabatier says that he followed Ledran's practice, and used the gorget.[‡] Desault describes various proceedings known under the name of "boutonnière," and the various purposes for which they were employed, characterizing the operation as either useless or dangerous when applied to the relief of stricture.[§]

But before the case of Chopart, John Hunter had practised an external operation in the perineum when a false passage existed, and prevented the successful employment of dilatation. He opened the urethra behind the stricture, pushed up a hollow canula to it, and passed a similar one down to it by the external meatus, "until the two canulas oppose each other, having the stricture between them." Through the upper one a trochar was then passed, the obstruction perforated; and, the continuity of the passage being established, a catheter was introduced along it into the bladder, and retained there for some time. Dilatation was employed until the wound was healed. This was in 1765.[‖]

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[*] "A Critical Enquiry." London, 1750, p. 151.

[†] "Traité des Mal. des Voies Urinaires." Revue par Pascal. Paris, 1830, vol. ii. p. 364.

[‡] "De la Med. Oper." Paris, 2nd edition, 1810, tome i. pp. 348.

[§] "Traité des Mal. des Voies Urin." Edited by Bichat. Paris, 1799, pp. 325–9.

[‖] "Treatise on the Venereal Disease." Lond., 2nd edition, 1788, p. 140.

When extravasation of urine existed, he also passed a director into the urethra, and opened the canal upon it.[*] But that operation which has been known of late years as the perineal section, he performed in St. George's Hospital, in 1783, for the *cure of stricture and perineal fistulæ*, and not for the relief of retention or extravasation. Having failed to pass the stricture with the finest bougies, and having used caustic subsequently without success, Hunter proceeded as follows. "A catheter was first introduced as far as it would go, as a director, and all the sinuses were laid open to that catheter, which exposed near an inch in length of that instrument; then the catheter was in part withdrawn, to expose that part of the urethra which was laid bare. The blood being sponged off, the orifice in the stricture was next searched for, and when found it was dilated. The catheter was now pushed on to the bladder, although with some difficulty." It was tied in, the fistulæ ultimately healed, and he passed "rather a full stream" of water by the urethra afterwards.[†] Lassus performed a somewhat similar operation in 1786, at the Hospital of St. Côme, at Paris, upon a man the subject of numerous fistulous openings in the perineum, which resulted from a blow. He introduced a sound as far as an obstruction in the urethra, divided all the fistulæ from the point of the staff downwards, and passed a gum-catheter from the meatus to the bladder, retaining it there for some time. The patient was cured. This case was not published until 1825, from some manuscript notes in the possession of M. Dolivera.[‡]

The application of the proceeding described by Hunter appears to have been limited, for many years, to those cases in which several perineal fistulæ co-existed with obstinate stricture. Thus it was advised, but for these cases only, by Sir Charles Bell, about a quarter of a century afterwards.[§]

The opinion at length gained ground that this method was especially applicable in cases of retention, because the accomplishment of two important objects might probably be achieved by one operation, viz. relief to the bladder, and the radical cure of the stricture by dividing it; the principle on which, as we have seen, J. L. Petit had already acted in some cases. Now, however, the urethra being opened, the rude gorget and trochar were no longer employed, but a careful search was made, by means of a fine probe, for the orifice of the stricture, so that the contracted canal itself might, if possible, be fairly laid open, and a full-sized catheter passed from the external meatus to the bladder. The operation was often tedious and difficult; the more so when it was the custom to seek the urethra by incisions commenced by the side of the raphé, as in the lateral operation for lithotomy, and not in the median line of the perineum.

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[*] "Treatise on the Venereal Disease." Lond., 2nd edition, 1781, p. 146.

[†] Idem, p. 160.

[‡] "Archives Générales de Médicine," vol. ix. pp. 411 and 414. Paris, 1825; where Vanier, of Cherbourg, is reported as performing the same operation for fistulæ; but this took place in 1819, and has therefore no historical value, although recently invested with it in Paris, on which account only is it named here.

[§] "System of Operative Surgery." Lond. 1807, vol. i. p. 121.

The practice of this operation, as applied to cases of retention, appears to have been adopted in this country at the commencement of the present century. The first published account of its performance appeared in 1815, in a little work by Mr. Grainger, of Birmingham, who advocated its employment, relating several cases in which he had done it, both in the central line of the perineum, and by the side of the raphé.[*] John Bell briefly suggested it for cases of retention, but had not performed it (1806).[†] Sir Charles Bell also published a recommendation of the practice in 1816,[‡] which he had before given orally in his lectures. In 1811, Mr. Thomas Chevalier read a paper at the Medical and Chirurgical Society, in which he related a case of obstinate stricture of the urethra, where he made an incision into the urethra behind the stricture, but not during a crisis of retention, for the sake of fulfilling two purposes, which he describes; first, in order to withdraw the urine from the diseased parts by giving it a new course, since he had observed much benefit to accrue in this way in cases in which the bladder had been punctured; secondly, to relieve the canal from pressure occasioned by hardened tissue in the perineum.

It must here be observed that all these operations, excepting the two of J. L. Petit referred to, were employed to cure some serious complication of the stricture, and not the stricture itself; or, if directed against the stricture, it was for the purpose of laying open the part to view so as to apply freely some kind of caustic. In other cases there was always present either retention of urine, or extravasation, or false passage, or fistulæ. In no case was the single indication of curing an obstinate stricture held to warrant the performance of the cutting operation. Petit alone had so regarded it, but, having exposed the point of the sound, he forced a passage at hazard by means of a trochar, an essentially different proceeding from carefully dissecting through the narrowed passage.

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[*] "Medical and Surgical Remarks." By E. Grainger. Chap. i. London, 1815.

[†] "Principles of Surg.," vol. ii. p. 285. Lond. 1806.

[‡] "Surgical Observations." By Charles Bell. Part i. p. 56. London, 1816. More than one French author has recently claimed the credit of first performing this identical operation for Eckström, whose first case (for the relief of retention, not for the cure of stricture) was published in Froriep's Notizen, vol. xviii. p. 155. Weimar, 1827. (!) Chelius gives an account of it in his "System of Surgery" under the subject "retention of urine;" but is not aware that it was described in England twelve years before. The accomplished editor of Chelius in this country, Mr. South, says, in a note, that Eckström stayed in London some months about the year 1821–2, and "must have seen it performed again and again in the precise way in which he describes it." Vol. ii. p. 428.

The first record, as far as I am aware, of this latter operation, as applied to the relief of impassable stricture, unaffected by the complications referred to, is to be found in a valuable paper by Mr. J. M. Arnott, then of the Middlesex Hospital, read at the Medical and Chirurgical Society in June, 1822 (Trans., vol. xii. p. 351).* A case is related in which the author, being unable, after repeated efforts, to pass any instrument through the stricture from the external meatus, had operated with the most satisfactory results, and advocating an adoption of the same method in similar cases. In this instance, having cut upon the point of a sound carried down to the stricture, Mr. Arnott succeeded in passing a very small grooved probe through, and in dividing the contraction upon it. A silver catheter was then carried into the bladder, and retained there, being withdrawn at occasional intervals only, and the wound was allowed to heal over it. The patient experienced a complete cure; for during six or seven years subsequently, during which he remained under Mr. Arnott's observation, there was no return whatever of the complaint. Of late years this proceeding has become known as the operation of "perineal section," by which term I shall in future speak of it.

The late Mr. Guthrie, in a work published in 1836, containing a portion of his lectures delivered at the Royal College of Surgeons in the year 1830, recommended the operation of opening the urethra behind a stricture in cases of retention; and in those instances in which the stricture "is of a thickness, hardness, or extent leading to the expectation of the cure (by dilatation) being difficult or prolonged," to divide the contracted part itself also, commencing at the opening thus made, and consequently in a direction *from behind forwards.** He also strongly insisted upon the necessity which exists for making the incisions in the middle line, and not at the side of the raphé. Mr. Guthrie has also recommended the same proceeding as the best method of incising an impassable stricture, when it is considered necessary to resort to perineal section for its cure, and not during the crisis of retention. His own description of the operation, which is detailed with care, and at considerable length, is given in Chapter X. on "Retention of Urine," to which the reader is referred.

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* The propriety of performing such an operation is considered, and partly entertained, with a view to future practice, by Sir C. Bell, in his Treatise on the Urethra, &c. Lond. 1822, 3rd edition, p. 184.

THE PERINEAL SECTION.—In the hands of most surgeons, however, I believe that the method, before alluded to, of making an incision upon the point of a sound firmly maintained against the face of a stricture, and passing a grooved director through upon which to divide it, would afford the best practical results in cases in which the division of an impermeable stricture must be resorted to. The best mode of performing this operation is as follows:—The patient should be placed, in a good light, on a table—not upon a bed, so that the pelvis may not sink—and be secured as for lithotomy. The bowels should have been previously cleared by an enema. The perineum having been shaved with a scalpel, a catheter is to be passed as far down the urethra as the obstruction will permit, and held firmly in that position by an assistant, who at the same time draws the scrotum forward. An incision through the skin and cellular tissue is now made, directly in the middle line of the perineum, along the raphé, from over the point of the catheter to within a short distance of the anterior margin of the anus, if the stricture be at or near to the bulb of the urethra, and the point of the catheter is to be exposed by a shorter and deeper incision. The sides of the opening are then to be carefully held apart as widely as possible with hooks, by an assistant on each side, so as to give the operator as clear a view as possible of the contracted opening; and this object is further to be promoted by a diligent sponging of the part; or better still, as Mr. Avery first suggested and practised, a loop of thread should be passed through each margin of the urethral incision, including the mucous membrane close to the stricture, so as to open out the passage, and dispense with hooks or fingers, which might intercept the view. The loops serve also to guide the eye to the exact spot at which the stricture commences, during any stage of the dissection which it may be necessary subsequently to make.* This done, the operator, who should be provided with two or three grooved silver directors of the very smallest size, should endeavour to carry one of them through the contraction, and if he be successful in accomplishing this, the division may be made with ease and safety. He may not be able to pass the director more than two or three lines until, having made a careful division so far, he may be enabled again to follow the track of the contracted canal, and to divide another portion of it upon the instrument. But if one of the directors cannot be introduced, either partially or entirely, no alternative remains but to dissect through the structures in the median line, endeavouring to follow the urethral canal as closely as possible. In either case, as soon as the continuity of the passage has been restored, the catheter first employed is then to be carried onwards into the bladder, and secured in the usual manner.

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* "Anatomy and Diseases of the Urinary and Sexual Organs." G. J. Guthrie, F.R.S. London, 1836.

Now as to the applicability of the operation of perineal section, whatever may be said of it in circumstances of retention, the consideration of which will come hereafter, the case must be bad indeed in which we are compelled to resort to it as a means of cure. All surgeons have regarded it at best as a dangerous remedy. The uncertainty which must attend an attempt to divide, by mere dissection from the surface of the perineum, an inch or more of contracted urethra, whose calibre has been reduced to what is almost a capillary bore, especially if the tissues are unnaturally thickened and condensed, will be admitted by all; and few, perhaps, would undertake to assert, unless a grooved director can first be passed, that an accurate division can be insured, or, indeed, that it is ever made. Thus Sir B. Brodie says:—"Even under the most favourable circumstances it cannot be otherwise than doubtful whether the stricture be properly divided, that is, whether the incision has passed through the narrow canal in the centre, or through the solid substance on one side of it. I suppose that no surgeon would recommend such an operation except as a last resort, where no instrument could be made to pass through the stricture by other means."* Every chance of getting an instrument through the stricture that can possibly be derived from the employment of rest and constitutional treatment, in addition to the most careful and repeated manipulations, should be exhausted before we consent to employ it, failing in which, its necessity and utility may be admitted as a last extremity.

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* Very recently M. Sedillot, Professor of the Faculty of Medicine of Strasbourg, has insisted upon the advantage to be gained by the employment of this method, describing it as an improvement of his own, in a paper read to the Académie des Sciences at Paris, and reported in "L'Union Médicale" of Nov. 6, 1852.

In reviewing the history of external operations performed in the perineum, which has been given somewhat at length on account of the imperfect statements which have been made respecting it by some authors (as an example of which see notes at page 261–2), it appears that these have long been recognised as necessary to the cure of some cases of stricture which have been impermeable to any other method; and during the last thirty years a good many such cases have been thus treated. That many instances in which they have been performed have terminated fatally, is a fact too notorious to need corroboration by cited reports. Nor would a classified table of such cases furnish data of any utility in testing the value of the operation. For it has been rarely performed except as a *dernier ressort*, as a proceeding of necessity and not of choice, and in certain old strictures of the worst kind in which renal disease has often co-existed, and rendered the patients particularly bad subjects for any operation. And with such a class of cases it is impossible to decide what percentage of deaths should be considered as favourable or adverse to the operation, as indeed it also is in many of the individual cases, to apportion the respective influence of the disease, and of the remedy, in bringing about the fatal result.

OPERATION BY MR. SYME. — But certain new views respecting the external operation upon the urethra, and a peculiar method of performing it, have within the last few years been advocated by Mr. Syme, of Edinburgh, the consideration of which will now come before us. The cases to which he applies it are not those in which it has been the custom of surgeons to operate by external incisions.

It seems necessary to premise that some misunderstanding respecting the nature and design of this operation has prevailed amidst the numerous discussions respecting it, which have at various times come under the notice of the surgical profession; and as great interest has been excited by these discussions, as widely differing opinions have been expressed by practical men respecting it, and as the question itself is one of no mean importance, I shall take especial care to state it fully, with scrupulous accuracy and impartiality, and then endeavour to arrive at clear and correct views concerning its merits.

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* Op. cit., p. 67.

Let it be first stated, in order to avoid confusion and misunderstanding, that I am not about to discuss any methods of affording relief in retention of urine, but simply certain operative measures which have for their object the cure of obstinate stricture.

Hitherto, both in theory and practice, it has been held to be an axiom among all surgeons, that *when a sound of any size can be passed through a stricture into the bladder, division of the stricture from the surface of the perineum is certainly contra-indicated.*

In 1844 Mr. Syme published in the "Edinburgh Journal of Medical Science" for October, the report of a case of stricture, in which he had applied dilatation both temporary and prolonged to their fullest extent, and afterwards internal incisions, without in any degree improving the patient's condition; for he found the tendency to contract so strong, that within the subsequent twenty-four hours of each operation, at which large bougies had been passed with perfect ease, the stricture was still as narrow and as difficult to pass with a small instrument as ever. His patient protesting "that life was not desirable under the torment of his complaint," requested that any other means of cure might be adopted, "no matter at what expense of pain or risk of danger." Accordingly Mr. Syme passed a grooved sound into the bladder, and divided the stricture upon it from the perineum. The patient lives at the present day (1852), and has enjoyed perfect immunity from annoyance ever since. Moreover he has not even required the subsequent use of the bougie.

After repeating this operation several times in cases of a somewhat similar character to the foregoing, Mr. Syme proposed it for general adoption, stating his belief that "external division"* upon a grooved sound is a complete remedy for the most obstinate forms of stricture, while, for some cases of a less obstinate character, it affords a more speedy, safe, and permanent cure than simple dilatation.*

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* It is desirable to use "external division," or "external urethrotomy," to designate Mr. Syme's operation, since he himself applies it, and to limit "perineal section" to that proceeding described at pages 264–5, which is resorted to in cases of *impassable* stricture. To the application of one term to two different or rather opposite modes of proceeding is mainly attributable the confusion of idea which has been so generally prevalent respecting them. Furthermore, Mr. Syme's operation is frequently employed anterior to the scrotum, in which case, I presume, even the advocates of the old term would be compelled to exchange it for another.

At this time, as well as at subsequent periods, in the course of discussion, and in connection with the publication of cases illustrating this treatment, Mr. Syme asserted that "*there was no truly impermeable stricture*," and that, consequently, the operation of perineal section (or that without a guide) hitherto employed was always unnecessary and improper. This statement, unqualified at that time by any kind of exception, naturally led the advocates of the old operation to challenge the correctness of the opinion respecting impermeability, and many discussions followed, not leading to much practical result, or even to any decision of the question.

Before proceeding, therefore, to consider the other propositions, it is necessary first to define clearly what is to be understood by IMPERMEABLE STRICTURE.

That the urethra is sometimes completely obliterated is an incontrovertible fact, and it is unnecessary to quote Chopart or Cruvelhier, each of whom relates a single case, to prove it, as has been done by some writers, since in our own museums are several examples. The reader is referred to several preparations mentioned at pages 60-1, and described in the Appendix, which are undoubtedly obliterations.

In the controversy which has been maintained on the subject, the oversight of a very simple fact has led to much unnecessary discussion. This I will endeavour to make apparent.

Mr. Syme denies the existence of "impermeable stricture," declaring that he has never met with one through which, the urine passing outwardly from the bladder, he has not been able fairly to pass an instrument in. He has been supposed to deny the existence of an obliterated urethra. This, however, he has never done, but makes a broad distinction between stricture and traumatic obliteration, which is not invariably recognised here. In corroboration of this remark, I may state that, having occasion to visit Edinburgh in the year 1852, I had the opportunity of witnessing the performance of an operation, by Mr. Syme, upon an obliterated urethra, caused by wound in the perineum, in which he passed a sound down to the obstruction, divided the cicatrix, and afterwards carried a catheter into the bladder. Since that time he has proposed another form of operation for such obliterations, as wholly distinct from strictures of the urethra. See note below.[*]

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* "Stricture of the Urethra." By James Syme. Edin. 1849. P. 58.

But as an additional illustration, it may also be recollected that Mr. Liston was accustomed to draw the same distinction. In a clinical lecture given during the winter session of 1835–6, he used the following words:—"It has been proposed in what are called '*impassable strictures*'—but there are no strictures impassable that I have ever seen, for *where any water comes away* you can by patience and perseverance get a catheter through sooner or later, to introduce," &c. He afterwards proceeds to remark, under a separate head, upon cases of complete obliteration, arising from traumatic injuries of the urethra, stating that he treats *them* by passing down an instrument as far as possible, making an incision in the line of the raphé upon its point, and carrying it onward into the bladder after.[†] This statement, therefore, is identical with that of Mr. Syme.

At this time Mr. Liston had never performed any operation for retention of urine beyond the passing of a catheter. He was compelled, however, on one occasion afterwards, to puncture the bladder, as well as to perform perineal section several times in cases of ordinary stricture, in which he failed to pass a catheter, and then he adopted precisely the same operation which has been referred to as recommended and described by Mr. Guthrie; and the directions for performing which he gave in his "Operative Surgery."[*]

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[*] The urethra being obliterated, as sometimes happens after wounds in the perineum, or from sloughing after extravasation, the urine passes through a free opening in that region. In such cases, which are totally distinct from stricture, Mr. Syme has proposed the following procedure, which he prefers to the ordinary mode of cutting down on the end of a catheter, because he believes it will ensure the production of the new channel in a more direct and natural course between the two portions of the canal than can be attained by dissecting with the knife. He directs the operator "to introduce into the bladder through the fistulous opening—which, if necessary, might be dilated—a staff, like that used in lithotomy, but with the groove on its concave instead of its convex side; then to insinuate through the urethra, so far as possible, the guide director employed for dividing strictures by external incision; and while the staff, confided to an assistant, was supported by a finger of the operator on the perineum, or in the rectum, to push the director onwards in the direction it ought to take if the canal were free, so as to pass through the obstructing texture, enter the groove, and proceed into the bladder. The state of matters being then similar to that of a stricture requiring division, after the director has been passed through it, there would be no difficulty in placing a knife in the groove, and cutting outwards, so as to divide completely, in the exact line of the urethra, all the thickened substance concerned, and afford free admission to a full-sized catheter, which may be allowed to remain for two or three days to prevent any risk of extravasation." Two illustrative cases are appended.—*Med. Chir. Trans.*, vol. xl, p. 113.

[†] "Lancet," Feb. 20, 1836. Report of a Clinical Lecture by Robert Liston.

Sir B. Brodie also recognises, to some extent, the same distinction, as may be seen by reference to his work.

From the numerous pathological facts afforded by our museums, it appears then that obliteration of the urethra does exist; that it is unquestionably rare; lastly, that it is very doubtful if strictures which are not of traumatic origin ever arrive at that condition. We have no evidence at least to show that they do.

Mr. Syme's assertion then amounts to this, and can be understood to mean no more, viz. that wherever the urine passes out by the external meatus a catheter may at some time or another be got in. Thus he writes: "As to the question of 'impermeability,' I simply maintain, that if the urine passes out, instruments may always, through care and perseverance, be got in beyond the contraction. It should be observed that the case here is quite different from that of a distended bladder requiring *immediate* relief. I have never maintained that in such circumstances the introduction of a catheter was always practicable," &c.[†] And I think that there are few surgeons who possess experience and dexterity in the use of the catheter who will deny the truth of this axiom *as a rule*; and such, if repeated opportunities are afforded of making the trial, will succeed in overcoming very nearly all the cases which come before them by fair means. An unlimited number of trials for the operator, and a good stock of patience on the part of the patient, are stipulated for by the author of the axiom we are discussing, judging by observation of the numerous reports and fragmentary notes which he has published at various times and places relating to this question. Nevertheless, taking the broadest view of the subject; regarding the fact that men of known and acknowledged ability and great experience have now and then failed after numerous attempts, I shall not dare to assert the impossibility of occasional exception to this rule. I dare not insist on the absolute inviolability of such a rule or axiom relating to a mass of facts, of which a portion only, however large it may be, can possibly come beneath the cognizance of one individual, such facts being the result of contingencies too complicated and influences too numerous for human mind to predicate what may arise out of them. In the second edition of his work, published since the foregoing was written, Mr. Syme tells us that on three occasions recently he has been foiled after repeated attempts. Here he opened the urethra immediately in front of the stricture, guided the small grooved staff through, and then divided upon it the contracted part in the usual manner.*

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[*] Thus Mr. Cadge, late assistant-surgeon to University College Hospital, who assisted Mr. Liston in most of his operations for a considerable period before his death, writes to the "Medical Times," Nov. 9, 1850, as follows:—"Certain it is that in the latter years of his life he was repeatedly foiled in the introduction of the catheter in ordinary stricture, and was obliged to have recourse to the operation described in his "Practical Surgery," 4th edition, p. 484. . . . . I have notes of four cases in which, after repeated unsuccessful attempts to introduce an instrument, he secured the patients as for lithotomy, and opened the urethra by an incision in the perineum. In these four cases I was present, and assisted at the operation, but they were by no means the only ones he performed."

Mr. Cadge afterwards relates a case (occurring in the practice of Dr. Brodie Sewell) in which Mr. Liston punctured the bladder through the rectum for retention of urine from stricture, stating that he "found it impossible to introduce a catheter more than an inch and a half into the urethra." I have Mr. Cadge's authority for stating, that the four operations in question were performed for the relief of stricture, apart from the crisis of retention, and that he never performed it, or any other operation, in the latter state, except on the occasion alluded to, when he punctured the bladder per rectum. In this case, which he saw in consultation (with Mr. Solly), the perineal section was suggested, but Mr. Liston objected, because not being able to pass an instrument down to the perineum, there were no means of knowing if other strictures existed in the passage.

[†] "Edinburgh Monthly Journal," June, 1851, Art. vi. By Professor Syme.

In reviewing the aspects of this question we nevertheless learn a useful lesson on the impermeability of stricture. No one can deny that a degree of dexterity in the use of the catheter is attainable by practice, which renders success in its employment almost certain, even in the worst cases. It is wise, and certainly conducive to the cultivation of skilful practice, to be well assured of the powers of the instrument, to cherish confidence in them, and to seek, by the patient pursuit of experience, to acquire dexterity in the performance of that which, in the oft-quoted words of Mr. Liston, is "one of the most difficult in the whole range of surgical operations." Most assuredly the cases are few in which a sound may not be passed by a skilful and persevering operator, perhaps fewer than they have generally been supposed. For my own part, I am free to confess that I have assuredly learned one thing, viz. that confidence in the power of the catheter and perseverance in its use constitute the secret of successful practice in its application. I can only not venture to assert, that whatever may have been my fortune hitherto, some future experience may not compel me to admit the existence of impermeable stricture, although it be manifest at the same time that total obliteration does not exist.*

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* Op. cit. 2nd edition, 1855. Pp. 36 and 95.

Circumstances, as has been before stated, have much to do with this condition. An obstruction which no man can overcome to day may be passable after a week of rest and careful regimen. When the opening is as small as some of those we see in our museums, its permeability may be affected by slight influences, and a dose of laxative medicine, or an altered state of urine, may enable us to succeed to day with an operation in which we failed the day before, and the converse position must be equally true. No man insists more strongly than does Mr. Syme, in his writings, upon the advantages to be gained by attention to hygienic measures in the reduction of narrrow stricture, and I have no doubt that he wisely takes the full benefit of the principle in practice.

Proceeding then upon the assumption that there are no impermeable strictures, and using the term to embrace an extent of signification which has been just explained, Mr. Syme proposes to reverse the maxim which was stated a few pages back to be an axiom accepted by the profession hitherto, viz.:—

A stricture being permeable to instruments, external division is contra-indicated;

And to make *permeability an indispensable pre-requisite to the performance of external division.*

This he does on the ground of the danger, uncertainty, and difficulty, which he asserts must attend incisions made in the perineum in search of the urethra without a guide.

It is conceived that there can be no difference of opinion in respect of this one point; that it is a proceeding infinitely easier in its accomplishment to the operator, and safer to the patient, to divide a stricture upon a grooved sound, than to dissect through one with the greatest care, but without the sound. The hazards are greatly increased in the latter condition. Nevertheless it may be called for when an instrument cannot be passed, and it must be admitted that, putting urethral obliterations aside, there are occasionally cases complicated with false passage, or in which strictures are very long, narrow, and perhaps tortuous, in which we are compelled to resort to an operation without a staff, especially under circumstances in which we must afford relief at a moment's notice, as in dangerous retention of urine, and have not time to devote to improvement of health, &c., as when no imminent danger exists. But whether this or any other operation should be employed under such circumstances, we shall have to determine under the chapter devoted to their consideration.

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* The doctrine that all strictures may be rendered permeable to instruments, if time and gentle efforts are expended upon them, is, thanks to Mr. Syme's unflinching advocacy, widely spreading, and has already been productive of the best results. How much less frequently is the old perineal section performed! In France, also, the same view is making progress. Nelaton has recently given his adhesion to it, and announces, as a triumph, the passing a slender instrument into the bladder, through a previously "impermeable" stricture, after an attempt of two hours' duration, by the hand of M. Phillips. See his Clinique, "Mon. des Hop." 1857, p. 569; also a paper by Guillon, "Gazette Méd." 1858, May 8; also "Gazette des Hop." March 27, 1858. Papers by Phillips, "Bull. de Thérap.," April and May, 1858. Papers by Mercier, "L'Union Médicale," July 6 and 8, 1858.

It now remains to consider the question of external division as a curative means for certain strictures *which admit the passage of a sound.*

This operation is essentially Mr. Syme's

"There are two forms of stricture," he says, "in which mere dilatation has been found inadequate to afford relief. In one of these the contracted canal is so extremely irritable that the introduction of an instrument aggravates instead of alleviating the symptoms, and exposes the patient to various dangers from the local and general disturbance thus excited."

"In the other the peculiarity consists in a contractile tendency so strong as quickly to counteract the effect of dilatation, and thus render it useless." *

The operation which Mr. Syme performs consists in passing a grooved staff through the stricture, cutting down upon it from the perineum in the median line, slitting up the whole of the contracted part on the groove of the staff, withdrawing the latter, and substituting for it a full-sized catheter, which is to be retained forty-eight hours. Dilatation is to be maintained for some weeks afterwards, and the wound encouraged to heal by granulation, not by primary adhesion. The details of the preceding will be fully described hereafter.

Let us now bring to the test of inquiry the merits of this operation. In commencing the subject of treatment, it was stated that in order to accomplish the cure of stricture two indications must be fulfilled; THE FIRST, to make dilatation of the canal; THE SECOND, to maintain it when made.

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* "Edinburgh Monthly Journal," July, 1852. P. 33.

It must already have become apparent, that when the calibre of the canal has been restored by dilatation, it does not by any means necessarily follow that the *cure* is accomplished. It has been seen that while the contrary is the rule, there are not very unfrequently exceptions, and I conceive it will be unnecessary to adduce evidence from the writings of the most experienced surgeons of our own time, to show that this assertion is borne out by ample corroborative testimony. All who are interested in this subject are doubtless sufficiently familiar with our own writers. But the following extract, containing the experience of Civiale, who, perhaps, has possessed opportunities of acquiring it as considerable as any man in the sister country, may, perhaps, be less known, and is therefore appended.

He says "that most old strictures of the spongy part of the urethra are so dense, resisting, and contractile, that dilatation acts but little upon them, while cauterization only augments their irritability;" and further, "I have seen with such cases, even should a dexterous hand succeed in passing a small sound, every method fail, though long continued and conducted with the greatest prudence."*

It has been already observed, that while the use of the sound or bougie is, in the great majority of cases, equal to the cure, yet some cases there are in which, dilate as you will, an occasional but habitual visit must be made by the patient to his surgeon afterwards, in order to obviate that tendency to contract which confirmed and extensive stricture almost invariably exhibits in a greater or less degree. This is no very hard condition to impose upon a man who has long been the subject of such a disease. Neither has he any right to complain much of the treatment which guarantees him exemption from the stricture and its consequences on such terms. Some may object to the application of the term *cure* to such a case. It is a matter of opinion not worth discussing. A man in years, who has suffered long and severely from the tortures of the complaint, will be none the worse for calling on his surgeon every three or four months afterwards, nor will he complain of the cure while the enemy is so easily kept at bay.

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* "De l'Urètrotomie, ou des quelques Procédés peu usités de traiter les Rétrécissements de l'Urètre." Par Dr. Civiale. Paris, 1849.

Now there are some cases in which neither a monthly nor a weekly recourse to dilatation will procure for the patient even tolerable freedom from the miseries of his complaint. The use of the catheter barely preserves existence, and that a wretched one. Cure him it does not and cannot. His micturition is exceedingly frequent and painful, often interrupted altogether by an attack of complete retention. He dreads the use of the sound, yet knows full well he dare not dispense with it, having learned by painful experience the consequences of deferring the process. Prolong the interval which is wont to intervene between two consecutive applications of the catheter, and the instrument is with difficulty got into the bladder, or fails to pass altogether, and the symptoms of obstruction are aggravated, while in some instances the febrile attacks, which are certain to follow the use of the catheter, so greatly interrupt the prosecution of the treatment that no progress can be made.

Can we afford to such patients any relief beyond that which the catheter can give?

We may come to the conclusion, I think, that many of these may be greatly benefited, if not completely cured. I believe that I am warranted by experience in asserting that division of the stricture upon a grooved director is a remedial means of great value for some of the cases indicated, and that they appear to be generally comprehended by the two classes which, by process of exclusion, have been already designated as not amenable to any treatment hitherto described, and the grounds upon which this opinion rests will be forthwith adduced.

When a ring of contractile tissue exists, involving the structures around the urethra to a considerable depth, its complete division is followed by a new deposit of organized material between the incised surfaces, the subsequent union of which does not and ought not to be permitted to take place by simple adhesion, but, granulations having arisen, by adhesion of the granulating surfaces. The new deposit thus formed seems to permit of extension to a far greater degree than the old and dense matter forming the original stricture, and consequently it may, after some amount of consolidation has taken place, be sufficiently extended by dilatation to ensure a more patent condition of the urethra than before, being at least as amenable to that process as the constituents of a ***stricture which is of recent origin***, and which is well known in most cases to be easily removed by dilatation. On this principle, probably, may the cure be accounted for which often follows such division when all other means have failed.

In order to form an opinion of this operation, reference must be made to certain data, the possession of which is essentially necessary for that purpose.

These consist in the ascertained results, both immediate and remote, which have followed its performance up to the present date.

The operation of dividing a *permeable stricture upon a grooved sound*, as a means of cure, has now been very widely adopted by surgeons, both metropolitan and provincial. I have made it my business to write or see personally every surgeon who has performed the operation, as far as my means of inquiry enabled me to ascertain, and from almost every one I have received a prompt and full reply. In most instances I have received notes of each case; in many a statement respecting the remote as well as the immediate results, the former having been verified expressly for the purpose of my inquiry, up to the most recent date. I have in each instance asked for the *total number of cases* operated upon, with the number of deaths, so that the sum total, about to be published here, is a resumé of the *entire* experience of the surgeons who have so kindly and unreservedly placed it at my disposal. Any proceeding, short of this, would be useless; any collecting of published cases from journals would be calculated to mislead, because partial experience only is there generally reported. In this way only, is it possible, I conceive, to derive any benefit from the statistical method, much as it is abused, and much as it is, perhaps wrongly, slighted by many in consequence. The method appears to me to be wholly applicable here, when seeking to ascertain what is the mortality attaching to the proceeding. In relation to after results, although the large correspondence it has afforded me has produced a vast amount of valuable information, together with many practical suggestions, these are not susceptible of illustration by the method. Let me state, then, that I have taken the utmost pains to obtain data on which complete reliance can be placed, and that I do not include a single case, nor a single fact concerning one, the voucher for which is not in my own possession, in the operator's own handwriting.

I am not able to present Mr. Syme's own practice; the cases here referred to are solely those of other surgeons. Up to the number of seventy, Mr. Syme recorded his experience, and without a fatal instance; since that time he has ceased to do so. I only know that he has now met with a small proportion of deaths; but not possessing the exact numbers, his cases do not appear here. In the first edition of this work, his seventy cases appeared together with forty-three by other operators, the total number at that time.

The following list shows 219 cases by thirty operators. The total number of deaths occurring within two or three months after the operation, whether due to it or not, is fifteen. One certainly, two I think, fairly, were not chargeable to it, leaving, say fourteen, or slightly over six per cent. But four others were the subjects of advanced disease of the kidneys, and, therefore, ought never to have undergone the operation, and with our present experience would not have been submitted to it. The consideration of all these cases will follow immediately.

		Total Number of Cases.
Mr. Bickersteth	Liverpool	10
Mr. Birkett	Guy's Hospital	5
Mr. Cock	do.	11
Mr. Coe	General Hospital, Bristol	1
Mr. H. Coote	St. Bartholomew's Hospital	3
Mr. Coulson	St. Mary's Hospital	30
Dr. Cruikshank	Dalmellington, N.B.	1
Mr. Curling	London Hospital	7
Dr. Dunsmure	Edinburgh Royal Infirmary	7
Mr. Erichsen	University College Hospital	12
Mr. Fergusson	King's College Hospital	17
Mr. Fiddes	Hospital, Kingston, Jamaica	28
Mr. Gaye	Williton, Somerset	2
Mr. G. M. Humphrey	Addenbroke's Hospital, Cambridge	7
Mr. Hutchinson	Metropolitan Free Hospital	2
Mr. Lane	St. Mary's Hospital	7
Mr. J. R. Lane	do.	3
Mr. H. Lee	King's College Hospital	4
Mr. Mackenzie	(late) Royal Infirmary, Edinburgh	7
Mr. Marshall	University College Hospital	9
Mr. Norman	Southsea, Hants	2
Mr. Paget	St. Bartholomew's Hospital	3
Mr. Pemberton	General Hospital, Birmingham	3
Mr. Poland	Guy's Hospital	3
Mr. Quain	University College Hospital	9
Mr. Spence	Edinburgh Royal Infirmary	12
Dr. F. Thompson	Perth Infirmary	2
Mr. Henry Thompson	University College Hospital	9
Dr. Wallace	Greenock	2
Mr. H. Walton	St. Mary's Hospital	1
		219

My first intention was to have placed the number of deaths against each operator's name, but some of my correspondents who have had fatal cases, having expressed a wish that their experience should not be published, I have been able to meet the objection by simply giving the gross mortality, instead of placing the deaths against each name; this method in no way invalidating the general results which I have aimed at obtaining; not a single known case therefore has been withheld.

ESTIMATE OF THE OPERATION.—Two questions now present themselves for consideration:

FIRST,—What amount of danger attends the performance of the operation?

SECONDLY,—How far is it entitled to be considered as a means of cure?

In regard to the first inquiry, it has been stated that the hazard to which the patient's life is exposed by it, is too great to be incurred for the sake of obtaining the cure of his complaint. This view has not improbably arisen, in some measure, from the still common but erroneous habit, already alluded to, of confounding external division of a permeable stricture upon a sound, with the operation upon an impassable one without it.

Of the fifteen cases of death, nine were unquestionably due to pyœmia. Among the other cases, in four, death occurred within short periods after operation, viz. from one to six days, apparently from prostration or shock as it is termed, but in reality, perhaps, from a cause about to be discussed, urethral fever and suppressed urine (page 280): in one of these cases only, aged 67 years, was there any hæmorrhage; but in all four there was *organic disease, generally extensive of the kidneys* and bladder. In another case (of Mr. Spence, of Edinburgh, who is about to publish it) death occurred from peritonitis produced by the partial penetration of the inlying catheter through the coats of the bladder, this viscus having been kept perfectly empty.* In consequence it is not chargeable to

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* Thus Mr. Spence writes me—"The only fatal case I have recorded ought not to be placed to the account of the operation, for a catheter retained in the bladder might have produced the same result." The case, which Mr. Spence has kindly favoured me with, is as follows:—

"R. McDonald, æt. 46.—This patient had long suffered from stricture and fits of retention. The stricture had been fully dilated several times, and always relapsed, and his life had been in great jeopardy on several occasions, so that he urgently requested to have the stricture divided. After preparing him by a few days' rest and treatment, I the operation, although mentioned here. In the last case, death was attributed to exhaustion from hæmorrhage permitted to continue unchecked; of which case more particulars hereafter (p. 284).

The sum total then of fourteen or fifteen deaths, including every casualty, affords a rate of mortality of about six per cent. as the past experience of the operation. It is well worthy of notice that by far the larger proportion of the deaths occurred among the earlier cases, before the present results of observation and improved methods had been obtained. No one can deny that this is a small proportion; smaller certainly than has sometimes been stated, or rather surmised, by those who have spoken on the ground of "impressions," and not from the data which a large experience and a laborious inquiry alone can afford. It will be directly contrary to ample and irreproachable evidence, if the statement is again made, that the results of the operation in question are to be classed, in point of danger to life, with those of the capital operations in surgery. In fact, it cannot be affirmed from past experience to have been fraught with much danger, and with the advantages derived from that experience, even that amount of hazard is unquestionably diminished for the future. A certain proportion of deaths must be expected to attend on every operation in surgery, however slight, and nothing is better known to the hospital habitué than this fact.[*] The amputation of a toe or finger, the excision of a pile, the extirpa-

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divided the stricture on a No. 3 staff, and No. 10 catheter was then passed easily into the bladder. Everything went on favourably for forty-four hours, when, though the urine passed freely off by the catheter, and no irritation existed about the wound, he complained of severe pain in the region of the bladder. On my visit, an hour after this, I at once took out the catheter, and ordered him an opiate. This gave temporary relief, but vomiting, with abdominal tenderness and febrile excitement, intervened. These symptoms continued in spite of active treatment, and the patient died ten days after the operation. During all this time the urine passed freely, partly by the wound, and partly by the urethra. The post mortem showed that the thickened bladder of very small capacity had contracted on the point of the catheter, and had caused ulceration and perforation of its mucous coat. The whole thickness of the bladder was not perforated, nor was there abscess or infiltration, but the peritoneal coat was inflamed, and the whole peritoneal sac presented symptoms of intense recent inflammation. The parts in the perineum were nearly healed, lymph closing the urethral wound almost entirely."

[*] I believe all the examples of death by pyœmia were cases occurring *in hospitals.* One gentleman, in whose practice two deaths occurred, writes me:—"The two deaths were from pyœmia—they occurred in the same ward within a short time of each other, and at a time when this hospital scourge was very prevalent with us. On this account, I should be sorry to consider the results of my practice as a fair statistical estimate of the operation. I regard it, when properly performed, to be attended with very small risk to life."

tion of a small and simple tumour, even the mere passage of a bougie, are all occasionally attended with fatal consequences, and that most frequently from that same bane of hospital surgery, pyœmia, which has proved more fatal than any other cause here; and he has seen but little practice who cannot recall the memory of such occurrences in connection with the simplest operative proceedings. Nevertheless I imagine no one would seriously urge this fact as an objection to their performance.

But we have another cause of death, less formidable, it is true, than pyœmia, which has occasionally to be encountered in all operations on the urethra. A constitutional affection, prone to follow the exciting cause with great rapidity, has been designated and described as urethral fever (see pages 97-8). Its chief symptoms are rigors followed by sweats, prostration, small and rapid pulse, bilious vomiting, perhaps delirium, and sometimes suppression of urine; and generally succeeding to the passage of urine through a urethra which has been lacerated, cut, or otherwise injured. This state, which is liable to be manifested after any operative proceeding on the urethra, from the passing of a bougie upwards, frequently appears during the first week subsequent to the operation under discussion, usually on the third or fourth day. Generally speaking, it passes off in eighteen to thirty-six hours without treatment, or with the aid of opium, stimulants, and heat externally applied. But in by far the majority of cases, according to my experience, the last-named symptom, viz. suppression of urine, is absent. When this is manifested also, the danger is much greater; indeed, it is very considerable. Mr. Syme formerly described these phenomena as "nervous symptoms," and as "requiring no cordial or other treatment, except a strong assurance on the part of the surgeon that all is right."* But on more than one occasion recently, Mr. Syme has stated that he has been led to take a somewhat different view of such symptoms. He reports one case of death occurring in twenty-four hours after their onset, and another of suppuration soon following in different parts of the body, and death at the end of several weeks.† The fatal termination is happily a very rare occurrence, the disappearance of the symptoms being the almost constant rule. Among my nine cases of the operation, some manifestation of the symptoms appeared in two (Cases 14 and 15), but in each, before twenty-four hours, all had completely subsided. I have seen them

* "Trans. Med. Chir." vol. xxxvi. p. 260.

† "Lancet," Aug. 21, 1858.

of different degrees of severity in the practice of others, but never witnessed a fatal result after the operation in question, although in one, and one only, there was complete suppression of urine for twenty-four hours, with ultimate recovery.

It appears to me not improbable that these symptoms arise from a small quantity of urine becoming injected into the erectile tissue of the corpus cavernosum when lacerated or incised, perhaps mingling with blood there, and becoming absorbed; that they commonly subside, the urinary elements being eliminated by the healthy kidneys, but that where organic renal disease has pre-existed the excretory function becomes suspended, and a fatal result generally follows with rapidity. Thus it is that deep intra-urethral incisions, external division, and laceration of the urethra extending into the erectile tissue, are extremely dangerous in those who are the subjects of renal disease. Thus is explained that lesions of the male and not of the female urethra (a fact observed by Chassaignac) alone give rise to symptoms, since in the female the erectile tissue is wanting, or nearly so. And on this ground, I believe it is that in all urethral operations involving necessary or possible lesions of the canal, as lithotomy, lithotrity, and instrumental treatment of stricture, it is desirable to maintain as high a state of health in the patient as possible, that the system may develope sound and healthy lymph to protect the wounded surfaces from the possibility of any admixture of urine with the blood at this vascular spot. Mr. Syme employs a particular kind of tube in the wound with the same view. Both of these means will, however, be considered hereafter in their proper place. Three if not all of the four cases already alluded to exhibited symptoms which lead me to attribute the fatal result to the cause just described; and in these, as before observed, organic renal disease existed.

We may now consider contingencies of a less serious character. First of all is Mr. Syme's own experience up to the present time: Much has been written about hæmorrhage as a frequent and dangerous result of the operation. What is the evidence respecting it?

"As to the hæmorrhage, I seldom find it amount to more than one or two teaspoonfuls at the time of the operation. In young plethoric patients, there is sometimes, in the course of some hours afterwards, a farther flow, even to the extent of several ounces, from the corpus spongiosum, but this may be arrested by the slightest pressure of lint introduced between the edges of the wound. The only serious case of hæmorrhage I ever met with was in the case of a gentleman of about sixty years of age. About a week after the operation, when all seemed right, he began to bleed from the urethra. I then re-introduced the catheter with good effect for a few days, when the hæmorrhage returned, and proved so serious that I opened the wound, and tied an arterial branch, with the effect of finally putting a stop to the bleeding, and the patient is now in good health."*

The testimony of Dr. Murchison, now of King's College Hospital, formerly house-surgeon to Mr. Syme, as that of an unbiassed and accurate observer, is valuable.

He writes me as follows:—"As regards the question of hæmorrhage, I can speak with confidence as to upwards of twenty of Mr. Syme's cases, which came under my observation, while I acted as house-surgeon in the Royal Infirmary at Edinburgh. Of eighteen of these cases I have notes. In only one of all the cases did the hæmorrhage exceed one fluid ounce. The exceptional case was that of a stout plethoric gentleman, who lost a few ounces, certainly not more than six, by a general oozing from the wound. He made an excellent recovery, however, and in him the small quantity of blood lost was beneficial rather than otherwise."

It is quite impossible that any lengthened discussion can be introduced into this treatise respecting the conflicting statements which have appeared from time to time in various quarters on this question of hæmorrhage. But I have felt it to be of the utmost importance in pursuance of a determination to obtain the facts relating to it, to satisfy myself upon the point; and, having done so, I have no hesitation in affirming, after a full examination of the evidence relating to Mr. Syme's cases, that the statements which have been made by some writers respecting hæmorrhage have been greatly exaggerated, if not, in one or two instances, unsupported by facts.†

With respect to the cases by other surgeons, their statements respecting hæmorrhage are as follows:—

In one of Mr. Coulson's "there was a little oozing of blood at the time and subsequently, but no profuse hæmorrhage until the fourteenth day of the operation, when on making free division of the external wound, the bleeding entirely ceased." Mr. Coulson further remarks, that "the internal incision was considerable, and that the external wound was not of corresponding and sufficient size; the coagula therefore were retained, and became a source of irritation; when they were completely removed, the hæmorrhage entirely stopped. In another, "there was a little bleeding in the night, which was easily stopped by pressure." In a third, "two hours after considerable hæmorrhage took place, which was controlled by ice."

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* Clinical Lecture in "Lancet," Aug. 21, 1858.

† For those who desire to see a considerable portion of the evidence in relation to this subject, condensed and presented at one view, see "British and Foreign Med. Chir. Review," 1851. No. xv. art. viii.

In one of Mr. Cock's, "several ounces of blood were lost after the operation." In another, "I divided the stricture along the whole length of the perineum . . . . . He lost a considerable quantity of blood."

Mr. Fergusson writes, "I have seen alarming hæmorrhage, and one young man nearly lost his life from this cause, which continued from a wound in the bulb for twelve days, and brought the patient to the lowest ebb of life."[*] This remark, it should be understood, refers only to the first instance described above by Mr. Coulson, and not to any other or separate case.[†]

In one of Mr. Mackenzie's, of Edinburgh, "the blood lost in the operation from beginning to end, did not altogether exceed four ounces. The bleeding continued for a little after the patient was put to bed, but its amount was very trifling, and it soon ceased spontaneously." In another of Mr. Mackenzie's cases, "the only unusual occurrence in the operation was bleeding, which took place to the extent of about three ounces during the operation. . . . On the patient being removed to bed, the bleeding continued in spite of the application of cold; and a plug of lint was introduced into the wound, which at once arrested the hæmorrhage."

In one of Dr. Dunsmure's, of Edinburgh, "there was considerable bleeding, but well-applied pressure by means of a T bandage was sufficient to arrest it. It seemed to be a general oozing."

Mr. Spence writes me, "I look upon the *operation* as almost free from danger. I have never had bleeding or infiltration in any of my own cases, and I cannot recollect any case in which I have known hæmorrhage occur in cases operated on by others, except one case of secondary bleeding on the eighth or tenth day, and not productive of bad result."

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[*] "Practical Surgery." London, 1852. P. 777.

[†] This identical case, which certainly has been made the most of, has recently *again* appeared as an alarming instance of hæmorrhage (H. Smith on "Stricture," 1857, p. 249), no notice being taken of the fact that it had already appeared in print at least three several times as evidence in this matter. It is necessary to point out this fact, otherwise some diligent collector may (and most innocently) adduce these various recitals as separate examples. It may be as well to mention, perhaps, that the single subject of them all was strong and hearty soon afterwards, as I had the opportunity of seeing for myself.

Mr. Fiddes writes me, "I never encountered any very troublesome hæmorrhage, but in three of the cases (out of twenty-eight) there was smart oozing of blood from the wound, which caused me to plug the incision with lint at the time, which proved adequate to arrest all bleeding. In all my other cases I do not think that the quantity of blood lost exceeded one or two tablespoonfuls."

In regard to my own nine cases, in one only was the hæmorrhage at all considerable, and this from the very extended incision necessary (Case No. 13). It will be seen that I plugged the wound with lint for a short time in two others, but this rather as a precaution than as a necessity; and I certainly advise it when the oozing continues at all freely, and the patient has to be left a few hours. It can do no harm, and may prevent unnecessary loss of blood.

In one of the cases of death reported to me, hæmorrhage was believed to have been the chief cause. Neglect on the part of the gentleman in charge, after the departure of the surgeon who enjoined the necessary caution, to take ordinary steps to prevent it, is allowed to have occasioned this unhappy casualty. Such a result will occur sometimes after any operation on vascular parts, or in lithotomy also, where, however, hæmorrhage is much more common, and much less easily controlled. It was in this case, however, in no way chargeable to the operation itself, but to the neglect; still I have placed it to the account of deaths in my table, having been careful throughout to act on the principle of giving the utmost weight to every unfavourable fact relating to the subject.

No impartial observer who has gone with me thus far will hesitate, I think, to conclude that the occurrence of a certain amount of hæmorrhage, say a few ounces, may be reckoned upon as an occasional, although it appears to be certainly an exceptional result of this operation. Nor can we wonder at this; the bulb of the urethra is generally divided to a greater or less extent, and such division has been a source of hæmorrhage, *commensurate with the extent, and depending upon the situation of it*, in the experience of surgeons, from the earliest times, and why it should cease to be so now does not appear. In order to avoid it, the cardinal point of the operation must be carefully attended to viz. to cut in the median line; and this in sections of the bulb, is the line of safety, not on account of some traces of a fibrous partition which does exist there, but because the incision is then equidistant from the two branches of arterial supply which enter the bulb, one on each side, and thus the entanglement of coagula in the meshes of the erectile tissue is favoured, which cannot of course take place if the bulb be divided on either side, as the mouth of the artery is then nearly, if not quite, exposed. (See anatomy of the bulb, pages 36-7.) But if hæmorrhage does occur, I am bound to say, that the *difficulty in stopping it ought not to be great*. There being already a full-sized catheter in the urethra, it is only necessary thoroughly to plug the wound with strips of lint, to place a firm pad of the same material over it, and maintain it there by means of a T bandage closely applied, supposing that the use of ice to the hypogastrium and perineum is insufficient to command the hæmorrhage. In one case in which I operated, the perineum being disfigured and brawny from old fistulæ, there was smart bleeding at two or three points, from vessels which the ligature would not hold owing to the nature of this abnormal tissue with which their mouths were imbedded. Here I succeeded in stopping it completely by carrying a small curved needle beneath each bleeding point, placing a ligature round it, and cutting off the end of the needle with a pair of pliers so as to leave it in situ. At all events, under the worst circumstances no man can bleed to a dangerous extent who receives a proper share of attention from those around him. Few of those, I imagine, who have passed through a practical surgical noviciate at our hospitals, will fail to remember cases in which they either assisted at, or at least have witnessed, the successful treatment of obstinate hæmorrhage from a perineal incision, by pressure with the finger on the wound, as a last resort, maintained for hours together by changing the assistants as they tired. I am bound to say that dangerous or protracted bleedings are *never the necessary* result of the operation in question, and cannot in fairness be charged to it.

Urinary infiltration of the surrounding tissues has also been suggested as a not improbable result of the operation. I can only say I have never seen it, nor have I heard of its occurrence, except to a very slight and superficial extent.* Of all the consequences to be feared it would be one of the most dangerous, and if so great a hazard were incurred by the performance of the proceeding in question, I do not hesitate to say that its employment would be one of questionable propriety. Of course unless the deep fascia be divided to some extent, infiltration of the tissues near the neck of the bladder is obviously impossible. By adopting a careful manipulation, Mr. Syme states that this may always be avoided. Whether or no, the facts, which are indisputable, that any incision of it which can at any time be required need only to be exceedingly limited, and that we have no experience of its occurrence in any case, prove that it is not to be apprehended as one of the consequences of the operation, and cannot be ranked among them.

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* "Lancet," Aug. 21, 1858, p. 191.

Having thus far noticed the dangers liable to accrue from the operation, I proceed to the consideration of the second question proposed, viz.—

How far is the operation entitled to be considered a means of cure?

It is obvious that this very important inquiry cannot at present be answered so fully as it may be at some future time when the possession of a larger experience shall afford us more numerous data. The prosecution of inquiries into the history of patients, subsequent to their dismissal from a hospital, is pretty well known to be usually a fruitless task, and a large proportion is never heard of after that time. Nevertheless, from the numerous cases I have now observed, much sound information may be obtained available in the endeavour to afford a correct reply. There are *three* results which may arise from this operation—

It may fail to afford any relief.

It may cure for a short period, and afterwards be followed by a relapse.

It may effect a permanent cure.

Respecting the first class, putting aside the cases of death, it appears that a few cases *may*, for I cannot affirm it positively, be assigned to this category. Thus an attack of erysipelas has been known to occur, giving rise to sloughing of the margins of the wound, and such consequent loss of substance, that fistula has remained afterwards, from inability of the wound to close, at all events for a considerable period of time. I have myself seen one case in which an attack of fever occurring immediately after the operation has given rise to somewhat similar but less severe results; but no one, I imagine, would think of charging such exceptional occurrences to the account of the operation.[*]

Respecting the second class of cases, or those in which, the primary results having been successful, a relapse has followed at some time or another, we shall unquestionably find a larger proportion. Mr. Syme, so far from denying this, has on one or two occasions publicly called attention to the fact. He attributes relapses to the three following causes:—

FIRST.—To incomplete division of the strictured portion of the urethra. He conceives it to be essential, in order to attain as far as may be permanence of result, to divide the whole of the stricture, and even a little of the healthy urethra before and behind, in order to ensure it.

SECONDLY.—If union between the margins of the wound be permitted to take place too quickly after the operation, relapse is liable to occur. Hence a sound should be passed at intervals of a few days, during some few weeks after the operation.

THIRDLY.—If the patient continues addicted to the indulgence of those excesses to which the first occurrence of the disease has in many cases to be attributed, the non-appearance of relapse can certainly not be ensured.[†]

As regards other operators, the experience is pretty general that a certain amount of recontraction frequently appears. I believe this is in many instances due, as Mr. Syme states it was in some of his own earlier cases, to the stricture having been insufficiently divided. Still the relapse is generally not attended with anything like the original symptoms, and the balance for good is largely in the patient's favour. Almost all who perform the operation agree that it affords results which they could not obtain otherwise, and accordingly we see them continuing to perform it.[‡]

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[*] Since cured by Mr. Marshall, by means of his galvanic cautery, and at this moment making a good stream entirely by urethra, and passing a No. 7 occasionally.

[†] "Edinburgh Monthly Journal," July, 1852, pp. 33–4; also a Clinical Lecture published in "Lancet," May 10, 1856.

[‡] Respecting this point I am very glad to be able to cite the opinions of those gentlemen whose professional reputation and experience of this operation give great weight to any deliberate statement they may make respecting it.

Mr. Curling writes me as follows:—"I have lost sight of all the patients (seven) but one, although I have little doubt that I should have seen some of them again had there been a return of the disease." Of this one, a very obstinate case, operated on seven years ago, Mr. Curling says:—"I have seen him within a few months, and he continues

My own experience I offer here, without reservation, as a contribution so far as it goes to our knowledge in this matter. I have operated on nine cases during the past five years. The histories are briefly detailed at the end of the chapter; and let me add, that the entire record of a man's experience, although not large, is, if carefully made, infinitely more valuable than a very large number of selected or of imperfectly recorded cases. I will thus summarily present the results of these nine cases, in relation to the question of relapse, referring the readers to their histories for further details. As before said, I have not had a case of death. Case No. II passed the first two years after the operation in excellent health, and free from symptoms, but having passed two seasons of hard riding

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[illegible] I instructed him to pass an instrument for himself occasionally, which he continued to do for about a twelvemonth. I have generally found this [illegible] in order to secure the benefit obtained by the operation. I only resort to the operation in severe cases of old indurated strictures, or in very close and irritable strictures. For such cases I am satisfied that the operation is a valuable and effectual mode of treatment, and free from any particular risk."

Mr. [illegible] writes as follows regarding his seven cases:—"All these were very bad cases of stricture, and all had undergone the ordinary treatment, several times repeated, with only temporary benefit. In the first five, the result of the operation is very satisfactory. I question whether the result of any other treatment would have been equally good; that is, whether the patients would have been able to continue passing instruments for themselves, and so have kept the urethra in a healthy state. I infer from these cases that it is desirable, if not necessary, to continue the occasional use of the [illegible] after the operation. The operation was not followed by bad symptoms in any of the cases."

Mr. [illegible], with whom, during his recent visit to this country, I have enjoyed personal communication on this subject, made it his business to visit as many of his old patients as he could after his return, in number twenty-eight, for the express purpose of ascertaining the remote results of his practice. He wrote me in July last as follows:—"They were all bad cases, many of them complicated with fistulous openings in the perineum, and had resisted all attempts to cure them by dilatation. All were most unequivocally relieved and benefited by the practice adopted. In my total number of cases I have had only two who have shown decided relapse, and a third had a return of the contraction in a partial degree. They had neglected the caution of passing a bougie at intervals after the completion of the cure, but they yielded to dilatation when they again came under my care. I believe it to be very essential in this operation to pass a full-sized sound at intervals for at least two or three months afterwards, as some of the cases, though not all, manifest a tendency to recontraction; but with this precaution I am convinced that the procedure is not only quite safe in the hands of a competent surgeon, but that it affords the only means yet known of curing effectually certain forms of stricture."

Mr. [illegible] respecting the subsequent history of [illegible]

Mr. [illegible] writes:—"No instrumental treatment, unless [illegible] will prevent the [illegible] of strictures in those who will not [illegible]."—*Medical Times*, April [illegible] in the hunting-field, they then began to return. During the next two years the stricture was amenable to dilatation, but at the end of this period, although the subject of advanced renal disease, he was, contrary to my advice, submitted to a second operation and died. Case No. 12 was operated on two years and three-quarters ago, and there has not been the slightest return. No. 13, nearly three years ago, no return whatever. No. 14, two years and a half ago, no return whatever. No. 14 *bis* was discharged cured four years and a half ago, and has not been seen since. No. 15 two years and a half ago; some contraction and return of symptoms requiring treatment; but result nevertheless extremely satisfactory; when I saw him last (October, 1857), a No. 9 catheter passed into the bladder, and he used it from time to time. No. 16 more than two years and a quarter ago, was greatly improved for a time, but went to America six weeks after the operation, and neglected to use instruments. When I last heard (July, 1858), there were slight symptoms, but with a total of great improvement. No. 17, nearly a year and a half ago; not the slightest return. No. 18, nearly six months ago, one of the worst cases I have had, is perfectly well.

Several of Mr. Syme's own cases have also come beneath my own observation, at intervals of from one to eight years after operation; in one only was there any relapse, and that was easily controlled by dilatation; the case at eight years' interval is a perfect cure—this patient rarely uses a bougie now, except to assure himself of the patency of the urethra, for he has no symptoms whatever. There is, therefore, no alternative but to admit the fact that in many cases a permanent cure has resulted, and in most a considerable improvement.

Let us now inquire for what cases the operation is adapted, as far as our present experience enables us to judge. There are no cases which in my experience benefit so much as those in which the chief character of the stricture is extreme irritability. Occasionally, although happily not often, we meet with a patient who cannot endure the passage of an instrument, however delicately handled, not merely on account of the pain caused at the time, which is always very considerable, but on account of the frequent and painful micturition, and the physical exhaustion, sometimes the severe rigors, which follow its introduction simply. (Case No. 18 especially illustrates this condition, and the beneficial result of the operation.)

Permanent or continuous dilatation is impossible from the distress it occasions, and which soon becomes unbearable. The stricture is generally narrow, and cannot well be subjected to internal division, the objection to which is the necessary preliminary dilatation. All these symptoms cease when the stricture is completely divided.

The next class of cases for which the operation is adapted is those in which the peculiar character is a strong tendency to contract, against which dilatation is powerless. All surgeons meet with such cases, and more frequently than with the preceding. They are not necessarily narrow, the stricture may admit easily No. 4 or 5, or even sometimes larger; but retention is constantly occurring, and dilatation aggravates the symptoms, almost invariably producing total inability to micturate for some hours after its employment. (See Case 15.) Sometimes the surrounding parts are much indurated, or the stricture itself is particularly so. When this is the case, the safest and most efficient method appears to me to be division of the stricture by the external method. If the induration is slight and can be divided by the internal incisions described and advised in the preceding chapter, that method is generally sufficient, although probably the relief is less complete and permanent.

Now, besides the two classes of cases mentioned, an additional indication for its performance exists when several old urinary fistulæ, situated at or near the middle line, complicate a stricture not readily yielding to dilatation, because they can be included in the incisions, and their healing is thus very effectually promoted. See Case No. 13; this condition was one of the reasons for so operating, and the result, as far as the patient's fistulæ were concerned, was entirely satisfactory. Those cases of stricture which are due to traumatic causes have been already seen to present the most intractable examples of the disease; and some of these will be found ultimately to require external division. At first they are often amenable to dilatation, and perhaps are sometimes cured by it, but generally speaking, this is not the case, and sooner or later most of these cases will be best treated by division; and that at an early period in their history, especially when presented in the persons of patients, whose daily avocations and habits render them very prone to neglect palliative means, and often subject them to danger from retention, &c.

It is certain that, putting this method aside, we possess no adequate means of affording relief to the most obstinate cases which come before us. By this term I desire expressly not to indicate those examples of advanced disease in elderly persons, which has resulted from many years of privation and neglect. Such are unquestionably, as a rule, not promising subjects for it, and among these it is less successful than among others. It is well adapted for those who have in all probability a large portion of life before them, and who possess, the stricture excepted, fair prospects of longevity. For them especially the operation presents little of danger, and affords very great relief. Some of those who have suffered a martyrdom for a few years, with barely palliative results from dilatation, obtain at once perfect freedom from their troubles, and return to the engagements of life with full vigour. On the other hand, to the elderly and broken-down constitutions the operation is formidable, and therefore, I think, inapplicable, since we cannot expect by it to prolong a term of life already nearly expended. In all cases where unequivocal signs of renal disease exist, I should be unwilling to perform it, and so much the more if even a tolerable condition of things can be maintained by palliative treatment, since patients so affected are most unpromising subjects for any mechanical interference, except of the most gentle kind, and when managed with the greatest circumspection. Cutting operations, especially in the course of the urinary track, are remarkably ill borne in these cases. I am certain that the proportion of deaths has been augmented by want of attention to this circumstance.

Again, a depressed condition of the vital powers may render the operation unadvisable, for a time at least. Success in this and other surgical procedures, those of lithotrity and lithotomy for example, is undoubtedly rendered much more probable, if attention is paid, especially in cases of enfeebled habit, to the improvement of the general health for a few weeks beforehand. Generally speaking, a regulated diet, soothing measures of a local character, tonics, and quiet, with gentle continued exercise in the open air, when possible, are extremely desirable for most patients, especially for those who are of an irritable or nervous temperament.

It will be inferred from the foregoing, that I am an advocate for this proceeding only in cases which are rare and exceptional. My number of operations, viz. nine in five years, will prove how seldom I have resorted to it,—that it has indeed been kept in reserve for such cases solely. And the results which have been attained are, not only in my estimation, but in that of all who have been acquainted with them, eminently satisfactory.

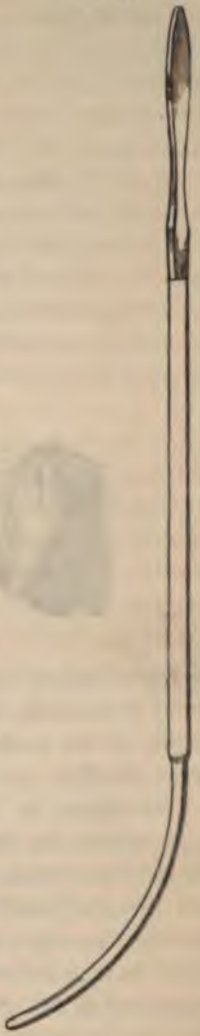
There is no question that, in order to attain both immediate and remote success from the performance of this operation, it is essentially necessary, not only to apply it to suitable cases, but to take certain preliminary precautions before undertaking the operation; to be guided by certain principles in performing it; and, lastly, to secure an efficient after-treatment.

Preliminary Proceedings.—If division of a stricture be the treatment decided on, it must be quite obvious that a clear idea of its precise situation and extent should be attained, if the purpose is to be accurately accomplished. We ought to be able to put a finger on that spot in the perineum (supposing it perineal) which corresponds to the strictured part of the urethra, and to realise its locality and extent in the mind's eye. I have no hesitation in saying that the performance *of a complete division of the entire portion of the urethra which is narrowed, and the limitation of the incision to a small additional portion before and behind it*, form the *sine quâ non* to a successful result in regard of the operation. It is this which requires the exercise of care, patience, and some little skill, and thus it may be most readily and certainly attained.

First of all we should ascertain the distance of the contraction from the external meatus. By introducing a graduated catheter, or sound of full size, such as a No. 9 or 10, as far as it will pass easily, we may determine the limit of its extent anteriorly with the utmost ease. Next we pass a bulbous sound of appropriate size, in the manner described at page 166, and learn by its freedom of motion behind the contraction, and the distance marked upon it at the moment of withdrawal, what is the extent of the morbid narrowing posteriorly. While still *in situ*, however, we should endeavour to distinguish the situation of the bulbous extremity of the instrument by applying the forefinger of the unoccupied hand to the perineum, and simultaneously moving the instrument a little, so as to mark with the eye the exact point in the perineum which corresponds to the obstructed point in the urethra. This can usually be done without difficulty. Having thus become familiar with the precise locality of the structures to be incised, on some previous day, and not immediately before the time of operation (for it is desirable then to have the urethra in as quiescent a state as possible, and not to subject it to any more manipulations than is absolutely necessary), the division is ensured in the following manner.

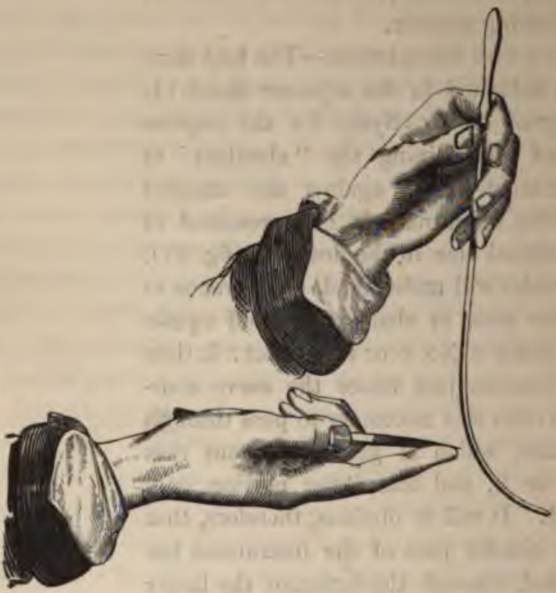
STEPS OF THE OPERATION.—The best form of staff (indicated in the adjacent sketch) is that designed by Mr. Syme for the express purpose of maintaining the "shoulder" of the instrument firmly against the anterior limit of the stricture. It is represented of half the actual size in the drawing (fig. 27), and the reader will understand, by reference to it, that the stem or shaft of the staff equals in girth about a No. 8 or 9 catheter: it then suddenly lessens, just where the curve commences, to the size necessary to pass through the stricture, which is generally about that of No. 1 or 2, and this latter portion only is grooved. It will be obvious, therefore, that when the slender part of the instrument has been passed through the stricture, the larger part stops abruptly at its anterior limit, and in making division this latter is easily felt by the forefinger through the tissues, and becomes an accurate guide to the contraction, provided the staff is maintained steadily in its position. For my own use, I have had a staff constructed with a hollow throughout, by which the urine issuing when it arrives at the bladder, the operator knows that the slender point is in its proper place, a satisfactory assurance when false passages exist, and render the right route rather difficult of access.

FIG. 27.



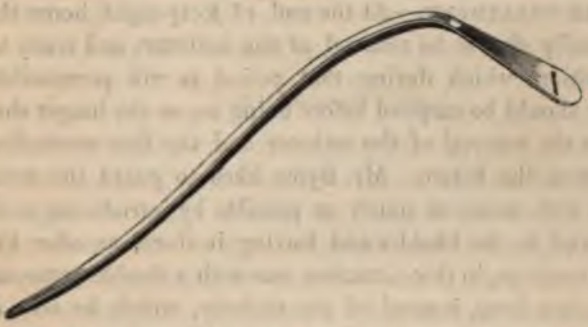
The staff having been introduced, the patient is placed in the position for lithotomy, on a table of convenient height, over the edge of which the nates are brought. If he is very restless under chloroform, it is better to use the bands, since it is necessary to have the perineum steady: but if not, the legs must be firmly held, each in the same level and position, by an assistant. Another holds the staff upright, and draws up the scrotum with the left hand. The

Fig. 28.



operator, seated, makes an incision in the line of the raphé, from above downwards, about two inches long, and steadily follows the direction of the median line, through the structures intervening between the skin and the staff, the line of which he feels for with the left forefinger, as he approaches it. He can now distinguish the thick end of the shoulder, and by that is guided to the position of the stricture, when, taking a sharp straight bistoury in his right hand and the staff itself in his left, which he holds firmly against the stricture, he engages the point of the knife in the groove of the staff about an inch below the shoulder, and cuts upwards to the extreme upper end of the groove, which penetrates into the thick portion of the staff for a short distance. This position of the knife, which Mr. Syme advises, is well represented by Mr. Bagg in the annexed cut; the blade lies along the forefinger of the right hand, with its cutting surface uppermost, the tip of the forefinger guarding the point. With the finger in this position, the operator makes the division in the manner just described of the whole of the contracted part; and as this may still not be entirely cut in the anterior direction, even when the knife has reached the upper end of the groove (for the tissues are apt to be pushed upwards and not cut, even when the knife is quite sharp), it is as well to draw out, or upwards, the staff for a quarter of an inch or so, and divide further to that extent. If the stricture has been properly divided, the shoulder of the staff may now be passed downwards through the incised part with the greatest freedom: if so, it may be withdrawn, and a catheter passed in its place. Since, however, the point of a catheter sometimes catches in the wound, and does not go readily into the bladder, perhaps from the urethra occasionally collapsing at the posterior limit of the incision, I prefer to introduce through the wound, before withdrawing the staff, a concave curved director along the convexity of the staff, into the bladder. (See fig. 29.) The staff being withdrawn, the catheter, on arriving at the wound, glides securely and certainly along the director into the bladder. Now it is a matter of no small importance, that no portion of the stricture should remain uncut. If, therefore, the catheter used (which should not be smaller than No. 10) be at all obstructed at any point of its passage, and be obviously grasped after it has been passed, we may rely upon it there are a few fibres yet requiring division, and *which will assuredly occasion future trouble*, that is, will cause relapse, if they are not incised.* Let them at once be so treated, either on the

FIG. 29.



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* To meet the difficulty in introducing the catheter here referred to, Mr. Marshall has employed a small grooved staff, over which the larger part forming "the shoulder" slides; the incisions being made, this part only is withdrawn, when a gum catheter is conducted into the bladder upon the staff, which is then removed.—(Described, "Lancet," March 7, 1857.) I believe, however, that difficulty in introducing the catheter rarely if ever occurs, except from the cause provided against by the director, *if the stricture has been sufficiently incised*, and that its occurrence should be regarded as a wholesome warning that a portion still requires to be divided.

catheter itself, if the operator can depend on his tact and knowledge of their situation to do so, or more safely, by introducing a large shouldered staff, by which their exact position may be instantly verified. Much future difficulty and disappointment may be prevented by thus providing at the outset for the perfect performance of our duty.

If the bleeding is free, as it may be in exceptional cases, perfect safety is ensured by plugging the wound (page 285). The catheter being secured in the usual way, a piece of india-rubber tubing is attached to it, and one end placed in a vessel. The patient lies on his back in bed, the legs supported by a pillow under each ham. Before he is removed from the operating table, I generally place in the bowel a suppository containing two or three grains of opium, and one of belladonna; and if he suffers much pain afterwards, a full dose of opium by mouth should be given and repeated.

AFTER-TREATMENT.—At the end of forty-eight hours the patient is generally glad to be relieved of the catheter, and ready to change his position, which during that period is not permissible. The bladder should be emptied before doing so, as the longer the interval between the removal of the catheter and the first succeeding act of micturition the better. Mr. Syme likes to guard the wound from contact with urine as much as possible by introducing a tube from the wound to the bladder and leaving it there, as after lithotomy; and he employs, in that situation, one with a double curve, and about nine inches long, instead of the catheter, which he now dispenses with altogether at first.* Rigors and bilious disturbance, with pain in the belly and loins, sometimes take place, generally soon after some act of micturition; and if so, occur usually between the third and the sixth day following the operation. The nature, import, and treatment of these have already been referred to. (See page 280.) I have seen these symptoms in two of my cases (Nos. 14 and 15). But Mr. Syme's more recent experience has led him to observe that a suppression of urine, which may continue for twenty-four or thirty-six hours, and even occasionally prove fatal, is sometimes coincident with them; but he believes that, in many instances, it is to be prevented by employing the tube above-mentioned.

With regard to the time at which dilatation should be commenced, about five or six days after the withdrawal of the catheter is, I think, sufficient for the first interval, and then the instrument which was tied in ought to pass with ease. I use it again in about four days, and expect the same result. If any marked obstruction now appears at any point in the urethra, we may be certain the stricture was not wholly divided, and if the patient is otherwise doing well, we should at once introduce a grooved staff, and passing a slender knife, like a common tenotomy knife, through the wound, make a slight incision in the required direction, which it is a very easy and simple matter to do, so that a full-sized catheter will pass; and such an instrument should be left in for a period of from twelve to twenty-four hours. The necessity for this procedure will happen sometimes; and it is wiser to do it at once than to leave it. The performance of this very slight and apparently trivial incision may make all the difference between a good and a bad result hereafter. (See Cases 16, 17, and 18.)

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* Clinical Lecture in "Lancet," Aug. 21, 1858.

To return. Whether this has been necessary or not, it will be desirable subsequently to pass a full-sized instrument, such as a No. 11 or 12 steel sound once a week for a few weeks. The patient can mostly learn to do this for himself in a short time. It may then be used once a fortnight, and finally once a month; and the practice may be continued if any disposition to contract appears, but if otherwise it is necessary only to make an observation from time to time.

Thus, in several cases of my own and of Mr. Syme's I have seen the patient once every few months, or every half-year, by way of ascertaining whether or no any contraction was threatening.

A slight modification of external division for strictures of the antescrotal part of the urethra has been sometimes adopted by Mr. Syme. He appears first to have employed it in 1844. By this method a narrow-bladed knife, somewhat resembling a tenotomy knife, is carried down from the external surface direct to the urethra, so as to inflict no other visible wound than that necessary to admit the blade, or at all events as small a one as possible, the internal section being, however, as free as the complete division of the stricture may render necessary. This method has been called by some "the subcutaneous." In the first instance Mr. Syme applied it both to strictures in the perineal and antescrotal parts of the urethra. The hazard which deep incisions in the former part involved, from infiltration of urine, led him, however, to abandon it there, and to restrict its employment to the latter situation, where it has proved successful. The late Mr. Avery also adopted it in the anterior part of the urethra in two cases, the results of which he described to me as extremely satisfactory. A small director is passed through the stricture and held by an assistant; a narrow-bladed knife is carried into it in front of the contracted portion, the penis being held firmly with the left hand, when the point of the blade is pushed backwards along the director, and the stricture divided, but without enlarging the external opening by which the knife was made to enter. A catheter is retained for forty-eight hours afterwards, and the subsequent treatment is to be conducted as already described.

Mr. Syme lays stress upon the importance of attending to the following particulars in relation to external urethrotomy, which I add briefly here:—

1. Maintain the median line in the incisions. 2. Make a direct opening down to the staff, and not a tortuous one. 3. Divide the whole of the contracted part, rather more than less. 4. Do not cut so far back as to endanger the deep fascia of the perineum, and use the knife in the deep incisions with the cutting edge uppermost. 5. Do not close the end of the inlying catheter, lest urine be forced into or through the wound for want of patency in the instrument. 6. Avoid escape or displacement of the instrument. 7. If incisions are made far back, introduce the curved tube through the wound when the catheter is withdrawn. 8. Do not neglect dilatation during the progress of recovery.*

I think this is an appropriate place to meet an *à priori* objection to the operation which has been made by a contemporary author, viz. that the proceeding must be unsuccessful, because a section of the urethra will of itself produce contraction through the known contracting property of cicatricial tissue formed in the healing process.

Now, if it be intended by this statement that the section of the urethra made in the operation *adds* another source of narrowing to the pre-existing one (and the objection loses its weight if less is intended), the result must necessarily be that the patient is always *worse* after the operation than before, which is manifestly contrary to fact, the most serious allegation respecting after results, indeed, being that in some cases he is no better.

Supposing, however, for argument's sake only, that the result of this incision *is* contraction, if, at the same time, that incision has diminished materially the pre-existing contracting tendency of the old stricture to which it was applied, so that the balance is now in favour of the patient, there being a smaller total amount of contraction after the operation than before—which is the fact beyond all question—then to name the first result and omit the second is tantamount to a suppression of the most important fact in the case, and the objection vanishes.

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* "Edinburgh Monthly Journal," April, 1851. "Med. Chir. Trans.," vol. xxxvi. p. 260. Clinical Lecture in "Lancet," 1856, May 10, and other places.

But that the result of the incision *is* contraction has yet to be proved. Clean incisions do not produce contractions anywhere. Wounds, *with loss of substance*, filled up by granulation, alone produce contracting cicatrices. Is it necessary to state that the cicatrix itself only contracts? If no portion of tissue, therefore, is removed in the incision, the adjacent parts remain in bulk and position as before, no vacant space having to be filled up. So much for general principles; now as to their application to the urethra. Does the urethra narrow after the incision for lithotomy? Certainly not. Further evidence is superfluous; but if more were wanting, M. Reybard's extended researches have, on this very matter, proved (had proof been necessary) that longitudinal incisions of the urethra never cause contraction, while undoubtedly contused wounds, with loss of substance, or transverse wounds adhering inaccurately, are common causes of urethral stricture.

Before quitting this subject I will briefly present an observation of the appearances seen in the urethra of a subject of the operation, who died two years and a quarter after of another disease, as I do not know that any other similar opportunity has offered.

The late Mr. Mackenzie, of Edinburgh, performed the operation in March, 1852, and the patient had no symptoms whatever of stricture after, and died of aneurism in June, 1854. He reports as follows:—The urethra having been opened from above, "a white depressed line of cicatrix, on the inner surface of the urethra, extending in the mesial line half an inch forward from the extremity of the bulb, corresponds exactly with the line of the cicatrix in the integuments and intermediate textures. The urethra in this part is rather wider than natural, from having a slight, funnel-shaped depression on the lower surface, and before being opened easily admitted a No. 12 bougie. In other respects the coats of the urethra present a perfectly natural aspect."—*Lancet*, Jan. 13, 1856.

In bringing the consideration of this subject to a close, I confess that these remarks have become extended beyond the limit of the original design, notwithstanding every effort on my part to render them as succinct as possible. But I have felt it impossible to do otherwise than discuss the subject fully, if at all. In a work of this kind it was imperatively necessary to make a laborious, careful, and, as far as possible, unprejudiced examination of the evidence presented in relation to an operation respecting which, although it has steadily risen in professional opinion during the last seven years, there are still divided opinions. I have been compelled to arrive at conclusions somewhat at variance, perhaps, with my own pre-conceived notions; but I have the satisfaction of believing that a fair and correct exposition of this much "vexed question" has been presented as the result of what has certainly been the most arduous portion of my labours in relation to this work. I have at least performed it with most honest intentions to eliminate the truth, as far as has been possible; whether altogether successfully or otherwise, time only, as it augments our experience, can determine.

CONCLUDING REMARKS ON THE TREATMENT OF STRICTURE.—Arrived at that part of this work which relates to the treatment of stricture, properly understood, and before proceeding to the consideration of fistulæ, urinary retention, &c., there is one observation for which this appears to be the appropriate place. It is this,—that no single species of treatment ought to be vaunted as the one exclusively appropriate method. Perhaps in no department of surgical therapeutics has greater dogmatism prevailed; perhaps in none is it so unwarrantable. Every surgeon who possesses tact, patience, and judgment, and of course a requisite experience, may undoubtedly treat successfully by his own favourite method, whatever it be, a large proportion of the cases that apply to him. But let not his success lead him to imagine or to persuade the world that *his method* is the only true one. The cure depends far less on the system selected, or the particular instrument employed, than on the man's own judgment and skill in applying it. Hence it is that the partisans of every rival method can and do most legitimately claim triumphant successes, each for his own pet scheme; while some, but less legitimately perhaps, appear more intent on bringing to light the failures of others. The exhibition of these selected cases proves nothing as to the inherent superiority of one method over another; and the very system which, in one man's hands, gives good results, may utterly fail in those of another, who attains equal results by a different course. One thing is certain;—it is, that no one method can be successfully applied to all the varieties of the complaint which a large field of practice produces. We cannot possess too many resources. We shall be unwise to deny ourselves the right to select with discrimination for each case its appropriate remedy. Such is the lesson which, I believe, is learned by most of those whose study and experience of the subject has been comprehensive and extended, and whose judgments are not warped by that predilection for a particular method which those who have discovered, introduced, or in some way become identified with it, are so prone to exhibit in a greater or less degree.

It now only remains, in pursuance of the principle which has been adopted in regard to each section of this work, to give, as briefly as possible, a final recapitulation of the CONCLUSIONS arrived at in relation to the entire subject of Treatment of Urethral Stricture, in order to afford a summary of the main points which it has been my aim to elucidate in the foregoing pages.

CONCLUSIONS.

1. That the process of Dilatation, carefully, judiciously, and perseveringly employed, is the most safe, efficient, and generally applicable of all means for the treatment of organic and permanent stricture (p. 167).

2. That since few organic strictures exist which are not considerably influenced at some time or another by the occurrence of inflammation or congestion in the surrounding parts, or by the action of spasm in the adjacent muscular tissues, it is of great importance, in most cases of difficulty, in order to attain success by the process of dilatation, to improve the general health by all the means in our power, to subdue local congestion, and remove all sources of irritation, whether in the urine itself, in the urinary passages, or in more distant parts, already pointed out as liable to aggravate the complaint. (Chapter V., also pp. 206–9.)

3. That while Dilatation is successful in curing the great majority of cases, there are unquestionably some in which either the effect is so temporary that the contraction re-appears on the cessation of the treatment, however long continued, or in which the urethra is so irritable that its employment aggravates rather than removes the symptoms (pp. 214, 274).

4. That the nitrate of silver lightly applied is sometimes useful in the last-named cases, inasmuch as it may exert a salutary influence upon the diseased surface of the urethra, relieving inordinate irrita-

bility, and checking undue vascularity and disposition to hæmorrhage, as it does in similar conditions of the skin and mucous membrane in other parts of the body (p. 231).

5. That the potassa fusa, as a caustic, is considerably more active than the preceding, and is therefore more dangerous of application. If used at all, it should be applied only in very minute quantities, inasmuch as it is exceedingly difficult to limit the action of so powerful an escharotic (p. 232).

6. That no agent should be employed in any case for the purpose of making an eschar or slough in the urethral canal (p. 232).

7. That Internal Urethrotomy is indicated in almost all strictures affecting the external meatus of the urethra; and in many cases of stricture situated about the middle of the spongy portion, for which dilatation, fairly tried, has proved unsuccessful (pp. 240, 249).

It is useful, also, in some few cases of stricture situated at the bulbous portion, which are not relievable by dilatation; a single incision, which is not deep, being free from danger, and frequently rendering the stricture perfectly amenable to dilatation afterwards. But *deep* internal incisions into the erectile tissue in this situation are always hazardous (pp. 244, 247).

That in all cases where it is possible, the operation should be performed by means of an instrument which cuts from behind forwards; and that those instruments which cut from before backwards should, as a rule, always have a guide in advance of the blade (pp. 236, 241).

8. That in strictures of extreme irritability, or with a strong disposition to contract, especially if attended by considerable induration, dilatation having failed after an ample trial, or being insupportable, External division upon a grooved staff is a safe and efficient mode of treatment (pp. 278–289). But that it is undesirable to perform this operation in cases of advanced renal disease, or in aged and worn-out constitutions, for whom palliative treatment is more safely employed (p. 291).

9. That when a stricture is impassable, *i.e.* when every available means has been patiently and perseveringly employed to pass a catheter through it, but without success, the old operation, or perineal section, may be performed as a means of cure (p. 265).

10. That it is a matter of great importance in deciding on the treatment of old or severe strictures, to ascertain what degree of organic renal disease exists as fully as our means of observation en-

able us, inasmuch as its presence renders *all* operations upon the urethra hazardous, to an extent, corresponding, on the one hand, with the severity of the operation itself, and on the other, with the extent to which the renal organs are implicated (pp. 204, 291.

The following are nine cases of External division on a grooved staff by the Author:—

Case XI.

Old and obstinate stricture—False passage—Dilatation inadequate to the cure—External division—Great improvement during four years.

G. H., æt. 48.—Applied to me Sept. 3, 1852. A groom by occupation. Habits free. Gonorrhœa several times; last attack *twelve years* ago: discharge almost constant, more or less.

Eight or nine years ago he first found obstruction in making water, and required to strain much to overcome it; repeatedly disturbed at night.

About seven years ago, his symptoms being worse, he applied to a surgeon in the country, who passed instruments, but never reached the bladder. He did not improve under this treatment. During the hunting season he was almost constantly on horseback, which always makes him worse. Coming home from a hard day's run, he would often be obliged to dismount "a dozen times," and strain to relieve himself, but ineffectually. Often took laudanum, which relieved him considerably.

About four years ago he suffered severely, and had a course of dilatation. No. 4 was the largest size which was ultimately passed.

Between two and three years ago he improved under another course at St. George's Hospital.

Nearly two years ago he was compelled to give up work, owing to the extreme pain and the frequency of micturition, which disturbed his rest, obliging him to rise ten or twelve times in the night, and, living near, he now sent to University College Hospital for assistance, and was removed there, suffering with retention and extravasation of urine; five or six incisions were made in the scrotum and perineum, through which the urine passed. He was an in-patient for four months, during which time instruments were introduced into the bladder. He then left, making a small stream of water, but neglected to attend as an out-patient.

About six or eight months ago he became an in-patient at St. George's Hospital; small instruments were passed, but not finding himself better, he left, contrary to the advice of his surgeon.

After this he was treated at his own dwelling: perineal abscess had formed and was opened. No. 2 catheter was passed with difficulty, and was tied in for thirty-six hours. Instruments were changed in succession, until No. 8 passed, his general health was attended to, he made a good stream, and was in all respects much improved.

Two months after this he again applied to me. No. 3 catheter was with difficulty passed, and after several attendances No. 5 is reached. There is a contraction about three inches and a half from the meatus, and a narrower one which forms the obstinate stricture at about five or six inches, the length of which, from before backwards, is not considerable, as appears by using a bulbous sound. In front of it is the commencement of a false passage, one or two inches long, running to the left side, not to be avoided without care.

November, 1852.—Urine purulent and slightly albuminous, not more so than the pus would occasion. Until lately he has had regular treatment by dilatation, and has certainly improved, but has neglected to attend during the last fortnight, and No. 3 can only now be passed with difficulty. He wishes to go to the country for work, but states that he dares not leave town, fearing the consequences to the stricture. Taking into consideration its obstinate character, the absence of signs of renal disease, and the inadequacy of dilatation to afford him continued freedom from his complaint, I recommended external division of his stricture upon a grooved sound.

March 1, 1853.—Having kept the stricture moderately dilated, and accurately determined its situation and extent, I performed the operation, at the Marylebone Infirmary, with the assistance of my friend Mr. W. Squire, and immediately afterwards passed No. 9 silver catheter into the bladder without any difficulty. The catheter remained in for forty-eight hours, and was then withdrawn. The bleeding did not amount to half an ounce at the time of the operation, and there was none whatever afterwards.

March 6. No untoward symptoms of any kind have appeared. No urine has passed by the wound, which appears to be healed.

March 8.—No instrument having been passed since the operation, No. 9 was passed to day with perfect ease.

March 15.—Nos. 10 and 11 were passed to day. He makes a better stream than he has done before for years, passes a good night, and is in all respects perfectly well.

May 12.—Catheters have been passed once a week. He states that he never made water better in his life, that he gets up once or at most twice in the night, instead of twelve or fifteen times, that the water is now quite clear, and that he feels perfectly free from all complaints about his urinary organs, which have been a source of misery to him for so many years.

September 20.—I have seen this patient after a lapse of three months. He is perfectly free from stricture or any tendency thereto.

1854, March 22.—I have not seen him until to day; and now he calls to tell me that, contrary to my advice, he has been riding through a hard hunting season, and that six weeks ago, for the first time, he found some symptoms of his old complaint. I passed instruments a few times, and dilated the urethra at the site of the old stricture very easily.

1856, May 1.—I have no record in my note-book since the last, more than two years. He had come occasionally to have instruments passed, generally Nos. 5 and 6, sometimes No. 7. He has been away from town and without treatment, but his symptoms are not severe. I passed Nos. 3 and 4. During the subsequent autumn he again required a little dilatation.

Early in 1857, during my unavoidable absence from town with illness, for a short period, he fell into other hands, and was admitted to a hospital. He was at this time greatly debilitated, his urine was *highly albuminous*, and No. 4 could be passed into the bladder. Contrary to my expressed opinion, Syme's operation was performed, and he sank one week afterwards. At the post-mortem examination chronic disease of the kidneys was found, and recent peritonitis of a low form.

Remarks.—For this long-standing case of stricture, external division was in the first instance a great boon. For two years subsequently to it he was almost entirely free from symptoms, which, until its performance, had been of the severest kind. But during this period he had hunted, as a whipper-in, for two seasons; an occupation, perhaps, the most prejudicial which could have been followed in his circumstances. I had warned him before of it as highly imprudent. Nevertheless, during the third and fourth years following the operation, his stricture was not very troublesome, and was amenable to dilatation. But careless habits and privations, in addition to his old complaint, were telling on the kidneys, and it was perfectly clear that these were in an advanced stage of disease. This condition being known, I would not consent to treat a patient by external division. The fatal results of operations of this magnitude on the urethra are notorious in the subjects of confirmed renal disease; the second operation was, on that account, in my opinion, unadvisable, and his death following it is an illustration of the remark.

I would add one observation in relation to the original operation by myself, viz. that its results, although good, would, I think, have been still better had the urethra been a little more freely divided, and had the wound not healed so quickly. It was the first time I performed it; and my present experience indicates the necessity for attending to these points. (See pp. 275, 277.)

CASE XII.

Severe stricture—Constant retention of urine and overflow—Dilatation at first successful—External division one year and a half afterwards—Complete success.

R. P., æt. 45. A coachman.—Admitted under my care at the Marylebone Infirmary, end of November, 1853.

Symptoms severe; disabling him from work for four months past. Bladder distended; overflow of urine during sleep; micturition frequent and painful.

December 17.—After a few unsuccessful trials, I passed to day No. 2 catheter, withdrawing fifty ounces of urine. Instrument was tied in for twenty-four hours, and exchanged for a larger, until No. 7 passed. Then ordinary dilatation was pursued until No. 10 passed with ease, and he was discharged, cured, in the spring of 1854.

1855, November 22.—He is re-admitted to the Infirmary, which he left one year and a half ago; no treatment since. During six weeks I applied dilatation, but rigors supervened, and progress was slow. Taking into account the fact that the stricture was more confirmed, and that he had neglected to maintain dilatation when in his power before, I advised external division. Stricture is five inches and a quarter from the meatus.

1856, January 8.—I performed the operation in the usual way, on a No. 1 grooved staff, assisted by my friend Mr. Filliter, resident surgeon to the Infirmary, and passed No. 10 catheter with ease into the bladder, where it remained forty-eight hours. There was no bleeding worth naming. No unpleasant symptom of any kind occurred.

January 15.—Nos. 10 and 11 passed.

January 21.—Nos. 11 and 12 passed; wound nearly healed.

January 29.—The same.

February 12.—The same. The wound perfectly healed.

February 26.—Discharged without a symptom of any kind.

June 10.—Perfectly well. Dr. Crisafulli, of Messina, a gentleman who is interested in this operation, and has come to England mainly for the purpose of studying it, passed No. 11 with perfect ease in my presence.

October 1.—He called upon me at my request, and I passed Nos. 11 and 12.

1857, June 6.—Not a sign of return. Passed No. 11.

1858, May.—As well as ever he was in his life. Stream full and strong.

Case XIII.

Old-standing stricture—Repeated extravasation and sloughing—Fistulous openings over pubes and throughout scrotum and perineum—External division completely curing the stricture, followed by a single fistulous opening, from loss of substance through previous sloughing.

J. P., æt. 62.

1855, September.—Admitted to Marylebone Infirmary, under my care.

Twenty-eight years ago symptoms of stricture began. Since that time he has been in almost every hospital in London, and under the care of almost every surgeon of eminence. Has had extravasation three times, which has caused an extraordinary amount of deformity from sloughing.

September 12.—*Present state.* Penis greatly deformed; several clefts in it, through which urine passes; two openings, each one inch and a half long, over right pubic bone: these are the principal channels for his water. Numerous fistulæ riddling the scrotum and perineum, which are enormously enlarged and thickened. No urine passes by external meatus of urethra.

September 20.—After several trials with all kinds of instruments, I succeeded in introducing the smallest catgut bougie into the bladder.

September 28.—After fresh trials, I got No. ½ silver catheter in, and drew off his urine. Tied it in.

October 1 to 8.—Continuous dilatation, reaching No. 5.

October 13.—Mr. Syme being in town, I gladly availed myself of his opinion. He advises very free division of the stricture, laying open the scrotal and perineal sinuses into one opening in the median line.

October 16.—Assisted by my friends Filliter, Gaye, and others, I proceeded to lay open the scrotal sinuses, the necessary result of which, from the state of the parts, was that the scrotum was divided, and each half, containing a testicle, was turned to either side; a large wound resulted from the perineal fistulæ also. There was considerable hæmorrhage, especially from one point deeply situated, which I ultimately secured by passing a curved needle beneath it. No. 10 catheter tied in. In the evening two other vessels secured, also with curved needles. Opiate; beef tea, with brandy in it.

October 17.—Slept tolerably; no bleeding.

October 18.—Takes nourishment; comfortable; removed catheter.

October 24.—Has gone on well; last curved needle came away to-day. Passed Nos. 8 and 9 with ease.

November 5, 11, and 18.—Nos. 9 and 10 passed on these dates. Half the urine comes by meatus, and half by the central opening of scrotum. All others healing fast.

December 6.—Has been rapidly improving.

1856, January 13.—Passed No. 10 with ease. Only one opening now, which is at the lower part of scrotum; all others, perineal and pubic, have soundly healed. The scrotal opening is surrounded with very hard and tense cicatricial tissue, and there appears no chance whatever of its closing, from the loss of soft parts around by previous sloughing. It gives him no inconvenience, and he is delighted with the result.

March 16.—Passed No. 10. No contraction of stricture—not a symptom of urinary distress. Water passes equally by meatus and opening described.

September 11.—No instrument passed since last report. Dr. Crisafulli of Messina, spoken of in preceding case, passed No. 10 easily in my presence. The one opening remains as before.

1858, June.—I have passed an instrument two or three times since last report, and No. 9 to-day. He has no other sign of his previous difficulties than the marks of numerous former openings, and the one existing opening before referred to.

Case XIV.

Old and obstinate stricture—Dilatation repeatedly, with temporary advantage—External division—Perfect cure.

E. C., æt. 44.—More than twenty years ago symptoms of stricture commenced. Numerous attacks of retention, often relieved with great difficulty. Several courses of dilatation, with temporary relief. Symptoms now very severe.

1856, February 27.—Admitted to Marylebone Infirmary, under my care. Succeeded, after some difficulty, in passing the very smallest silver catheter, and drawing off twelve ounces of retained urine. Stricture five inches and a half from meatus. Considering his history and symptoms, and his strong desire for permanent relief, I advised external division.

March 3.—Performed the operation on the smallest grooved staff. My friends Mr. Coulson and Mr. Filliter present. Passed No. 10 catheter with ease, and tied in. Oozing of blood general and free; plugged the wound with lint in consequence.

March 5.—Catheter removed. Slight bleeding, on a portion of the plug coming away.

March 6.—Rigors suddenly occurred this morning, with bilious vomiting, pains in belly; tongue dry; pulse 144, weak. Ordered wine and opium, and hot bottles externally. Removed remainder of plug, which had become offensive.

All these symptoms subsided in the evening; they formed an example of an attack which sometimes occurs; and fully described at p. 280.

March 7.—Much better; took chop and wine for dinner.

March 12.—No. 10 passed easily; March 18.—ditto.

April 1.—Nos. 10 and 11 easily.

April 4.—Wound healed; discharged this day cured.

Subsequently I passed No. 11 and 12 once a month, in the out-patient room at University College Hospital, during the summer and autumn. On June 16, Dr. Crisafulli passed No. 11. Not a symptom of discomfort of any kind.

1857, April 19.—I have not seen him for six months. Absolutely well. I passed No. 10, and then No. 12, easily into the bladder.

Case XIV. (*bis*).

Obstinate stricture—External division—Cure.

C. M., æt. 45.—Marylebone Infirmary. Admitted September, 1853.

September 14.—Symptoms very severe; rises many times at night; no stream, only an almost constant dribbling of urine. Stricture about one and a half inch from external meatus. With difficulty passed the finest probe through it, and dilated a little; then a grooved director, and upon it a small bistoury, and divided internally; maintaining dilatation afterwards, but with great pain.

During next month it was evidently recontracting, and symptoms continued.

November 5.—I passed a small grooved staff through the stricture; introduced a narrow-bladed knife from the under aspect of the penis, into the staff, and freely divided the stricture, leaving only a small external wound; tying in No. 10.

December 4.—No contraction. No. 10 passes easily. A very slight opening remains, which, with the aid of a little caustic, is contracting gradually.

Being perfectly free from symptoms he left a week afterwards; a mere pinhole remaining on the site of the operation. He promised to call on me if it did not close, or if any further symptoms appeared. I have not seen him since.

Case XV.

Very old and confirmed stricture—Constant attacks of retention—External division—Some tendency to contraction, but improvement great and satisfactory.

Captain ——, æt. about 50. Applied to me February, 1856. Stricture and treatment of every kind for many years, during which time he has been a patient of numerous London surgeons.

His symptoms are peculiar. He is subject to complete retention constantly, although No. 7 catheter passes, and is the instrument with which he relieves himself, sometimes two or three times a day; rarely passing three days without an attack, which is brought on by the slightest cause, and, once induced, is perpetuated by the irritation of the instrument employed for its relief. Passes water with much straining, and in a small stream. A small fistulous opening in scrotum.

On examination, I find, deep in the perineum, a hardened mass of deposit around the urethra. There is little doubt that this is highly contractile; as although No. 7 catheter will pass with some degree of pressure, still the orifice of the stricture, when undilated momentarily by the instrument, is very small, as the stream of urine is uniformly so.

March 15.—I have carefully tried various means without success; the stricture commences five inches from the meatus, and by means of the bulbous sound is distinctly verified as extending backwards fully an inch. I advised external division.

March 18.—I performed the operation on a grooved staff size of No. 4, aided by Mr. Clover and Mr. Filliter. Parts were very vascular. I tied a vessel after the first incision. Arrived at the deep parts, I never felt such rigidity of tissue, which creaked audibly under the scalpel. I divided fully an inch and a quarter of the urethra. No. 10 catheter passed easily, and was tied in. Bleeding was free from one point, and I stopped it by plugging the wound.

March 20.—Removed catheter and plug.

March 21.—Rigors; looks sallow; little vomiting; orchitis; pain in the back. To have effervescent salines and opium.

March 23.—Better.

March 24.—Appetite returned; in all respects better.

March 28.—Passed Nos. 10, 11, and 12.

April 10.—Passed Nos. 10 and 11; wound closing fast.

April 16.—The same; returned to the country; wound healed; to pass a sound, No. 9, once a week.

May 12.—He writes me he is in every respect well, and that the result "far exceeds my expectation."

In October he called on me, saying that the sound passed with difficulty, and that sometimes the pressure required produced irritation. No. 7 only would pass easily now.

On examining with a bulbous sound of appropriate size, I found that that there was a slight membranous contraction six inches and a half from the meatus, as if a few fibres at the posterior part of the stricture had contracted, or had been left undivided. With a urethrotome (fig. 23, p. 243) I divided these easily, obliquely downwards to the right and to the left No. 11 passed readily, and was tied in twenty-four hours.

At the end of the month No. 11 was easily introduced.

1857, February 28.—Under radical treatment for hydrocele; no symptoms of urinary obstruction.

October.—He passes No. 9 occasionally. I did so with a little pressure. His habit of passing large instruments irritates the urethra, and he gets retention if he passes No. 10; otherwise, symptoms are very slight. To let the urethra remain quiet, using only No. 7 occasionally.

CASE XVI.

Very old and obstinate stricture—Symptoms severe—Much unsuccessful treatment—External division—Rectal abscess—Much improvement.

A. B., æt. 46.—A gentleman from one of the southern States of America, who came to me for this operation, all other means having failed. He has visited this country twice before for treatment, by caustics, &c. He has been twenty years a great sufferer from stricture, but his history need not be detailed. On his way here he was in great danger at New York from retention; he remained there some time, but no instrument could be introduced into his bladder, although attempted on several occasions, when much bleeding ensued.

1856, April 7.—Passes water every three-quarters of an hour, and ten or twelve times in the night; it never amounts to a stream, even when straining, but only a succession of drops.

Examination.—No. 8 passes five inches—after trying other instruments, a small one passes seven inches, evidently into a false passage, the instrument being felt distinctly, close beneath the mucous membrane of the rectum, when the finger is introduced. After long and careful manipulation, I verified the entrance to this false passage on the right side of the canal; and by avoiding this succeeded in introducing No. ½ silver catheter into the bladder and drawing off several ounces of decomposed urine.

April 9.—Has made a stream for the first time for many months, since the catheter was introduced. I passed the same instrument and tied it in for twelve hours, but severe pain and spasm prevented him from bearing it longer.

During the next fortnight I made repeated attempts to dilate continuously: I reached No. 2, but the sensibility was so great, he could not bear the instrument, and begged to be cut, to which, seeing no objection, I assented.

April 25.—I performed the operation on No. 1 staff, shouldered, but with a canal through it, which, as there was a false passage in this case, was useful; the urine issued through the end of the staff as soon as it reached the bladder. Mr. Coulson and Mr. Filliter assisted me. Bleeding was rather free, but stopped by plugging. No. 10 passed easily, and was tied in.

April 27.—No bad symptoms—removed catheter. He ate fowl for dinner with relish.

May 2.—On introducing No. 10 it was a little grasped at the anterior part of the stricture, which I therefore divided with the point of a tenotomy knife, on a grooved staff previously introduced. No. 11 then passed easily, and retained for nine hours.

May 14.—Nos. 10 and 11 have been passed every four days with ease, going on exceedingly well. Nevertheless, the bladder is extremely irritable; retains his water only two or three hours.

May 24.—Has learned to pass No. 10 elastic catheter for himself.

May 28.—Wound healed. About to return to America. Stream good, but holds water only three hours at longest. To pass his instrument once a week, and, after a month, once a fortnight.

August 20.—Wrote me that micturition became more frequent during the journey and after his return. Suddenly, half a pint of matter issued by rectum at stool, since which he has much improved. This was probably an abscess between the bladder and rectum, the existence of which had doubtless been the cause throughout of his irritability of bladder.

July, 1858.—I have just received a letter from this patient, with a much-improved report. He says, "from pain I am now exempt; the stream, although small, is quite large enough to make me very happy when I think of former difficulty. . . . . My general health is surprisingly good." He has neglected the use of instruments.

CASE XVII.

Very narrow and obstinate stricture of many years' duration—Retention relieved by catheterism—External division performed on the catheter —Perfect cure.

1857, May 20.—I was desired to go into Suffolk to see a gentleman with retention of urine. I went instantly, accompanied by my friend and then pupil, Mr. G. Jeaffreson.

Retention had been nearly complete since the 16th, and no attempt to pass instruments had yet succeeded. The patient had been the subject of severe stricture for some years, which had presented extreme difficulty.

No. 8 catheter was stopped at five and a half inches, evidently by a firm unyielding stricture. I now introduced, and after a short time succeeded in carrying a No. 1 through the stricture and drawing off the urine.

It was suggested to me that it would be extremely desirable to perform external division, now that I was on the spot, if it would be likely to remove the patient's complaint. Seeing no objection, I consented to perform it. But the catheter was very tightly held; in the circumstances I thought it unwise to run the risk of removing it; and, accordingly, I proceeded to do the operation on the catheter, one of the ordinary kind. A little extra care was necessary, but I found no particular difficulty, and immediately afterwards replaced it by No. 10.

The bleeding was free, and plugging was necessary. I left Mr. Jeaffreson in charge, he having seen several such cases with me and others. The instrument was kept in forty-eight hours, as usual. Nothing could be better than his progress. A few days after a little recontraction was observed at the anterior part of the stricture. Mr. Jeaffreson introduced a grooved staff, and divided it. No. 12 now passed easily.

June 18.—Less than a month after the operation I heard as follows from his medical adviser:—"Mr. —— has for more than a week passed all his urine freely by the natural passage, and I this morning passed easily a No. 12 catheter, and found him so well that I have given him leave to go to —— (thirty-six miles distant) on business."

1858, July.—The same gentleman writes me:—"There has never been the slightest tendency to relapse. After a six months' interval I passed No. 12 with ease."

Case XVIII.

Excessively irritable urethra, with three extensive strictures; dilatation unbearable and useless—All three divided freely; one at the orifice by bistouri caché, the others on a grooved staff externally—Success.

G. R. F., æt. 31.

1855, October 6.—Stricture, with severe symptoms of about a year's standing. Retention, frequently occurring, incapacitates him from exercising professional duties.

Examination.—Narrowing just within the orifice, admits only No. 3; but the chief stricture is at four inches and three-quarters from meatus, and admits No. 2. During the month dilatation was applied with some little good effect, but the organs are exceedingly irritable, and much care is necessary. There is constant inflammation of the urethra, more or less marked, as evidenced by much discharge and scalding.

November.—Severe lumbar pain and fever. Dr. Jenner saw him with me, and we regarded these as symptoms of a mild attack of pyelitis.

He soon recovered, and was advised to go to the country for the present, passing for himself occasionally Nos. 4 and 5 elastic catheters.

1856, April.—Returned to town with severe symptoms; frequent retention, and constant urethritis as before.

The application of instruments is so excessively painful, and produces so much disturbance to the system, that I advised him to submit to external division. Mr. Coulson saw him at my request, and coincided in the opinion.

Soon after he had an attack of illness which prevented the operation.

In September he obtained an Indian appointment, and being somewhat better went out at once.

1858, March.—He has returned from India on sick leave; has suffered a martyrdom with his stricture, and desires to be cut at once. Health impaired; condition low. Decided on attending strictly for a month to the improvement of the health, and then, if result was good, to operate. At the end of the month he was decidedly stronger, but stricture so irritable that he could not be touched except under chloroform.

April 19.—Assisted by my friends Mr. Coulson, Mr. Erichsen, and Mr. E. Hart, I performed the operation. First I divided the stricture near the orifice, so that the shouldered staff might pass. A tight contraction was now detected immediately in front of the scrotum, through which only the slender portion of the staff would pass; this was freely divided from without, and the original stricture was also divided freely from the perineum. Owing to the complication of three narrow strictures, it was very difficult to discover whether each one was properly or sufficiently incised. No. 8 then passed easily into the bladder. Bleeding was rather free, not particularly so, but as he was weak I secured him by plugging the perineal wound. Full doses of opium, to which he has been accustomed.

April 21.—Removed catheter after forty-eight hours and plug. Passed No. 10 easily, and removed at once.

April 22.—A little sickness and rigors occurred after passing some urine, but soon subsided.

April 28.—Going on well; appetite good; but, on passing a No. 9, a little recontraction discovered at the stricture in front of the scrotum, and at the orifice.

May 1.—With a tenotomy knife, and small bistouri caché, divided the remaining contraction, and passed No. 12; tied in for twelve hours.

May 16.—Passed No. 12 at first every three days. No instrument has been passed for a week, and it went into the bladder with ease this morning. Drives out daily.

June 30.—He left town, passing easily for himself Nos. 11 and 12 every week.

August.—Perfectly well; wound healed; passed No. 11 with ease.

REMARKS.—This was a more severe case than any I have ever had or have seen in the practice of others as regards the extent and number of the incisions. The urethra was really more or less strictured almost throughout the whole of the spongy portion. He has not a symptom now.

CHAPTER X.

RETENTION OF URINE DEPENDING ON STRICTURE.

Retention of urine may be partial or complete—Engorged bladder and overflow of surplus urine; a common condition, and easily overlooked—Complete retention—Treatment—Inflammatory in a hale and young subject—Catheterism, Baths, Opium, operation of—Cupping in the perineum—Leeches—Retention from organic stricture in older subjects—Treatment—Baths, Opium—Time to be devoted to these measures—The tincture of iron—Chloroform—The question of making an artificial opening into the bladder—Much difference in practice in relation to this subject—The indications for operating—Over-distension is not to be permitted to continue because urgent symptoms are not present—Evil effects of over-distension—Over-distension may exist without giving rise to supra-pubic dulness—Various modes of making an artificial opening into the bladder—I. Forcing a stricture—II. Incisions into the urethra from the perineum—*a*. The perineal section—Difficulties attending the operation—*b*. The Boutonnière—Mr. Guthrie's method of performing it—Advantages of—Recommended by Sir Charles Bell—Mr. Liston—III. Puncture of the bladder—By the perineum—By the rectum—Mr. Cock's experience of the operation—Objections made to it—Injury to the peritoneum, vesiculæ seminales, &c.—Analysis of forty cases reported by Mr. Cock—Mode of performing the operation—Retention of the canula afterwards—Healing of the puncture—Contra-indications to the performance of the operation—Puncture above the pubes—Through the pubic symphysis—Consideration of these methods of affording relief—None of them frequently necessary—Extravasation of urine from rupture of the urethra—Ulceration, as well as mechanical distension, tends to occasion it—Local treatment of, must be prompt—General treatment—After results and treatment—Rupture of the bladder, symptoms of—Treatment.

RETENTION OF URINE depending on stricture may be *complete*, as when no urine will pass, although the bladder is full; or it may be *partial*, as when the bladder is quite or nearly filled and the surplus runs off; in other words, it is *engorged*, and its contents *overflow*.

The latter state is often called, but erroneously, *incontinence*: it would be more correct, and much more desirable, to employ this term only to designate a condition in which the bladder is really *unable to contain* the urine. Such real incontinence is a rare occurrence in the adult male, except from cerebral lesion. This is a fact which it is of the utmost importance that every student should know. It is an axiom, the value of which, in practice, cannot be overrated, that "AN INVOLUNTARY FLOW OF URINE INDICATES RETENTION, NOT INCONTINENCE." How often has the overflow of surplus urine from an engorged bladder concealed the real condition from an inexperienced practitioner; leading him to believe that the viscus was empty, instead of the subject of a, perhaps fatal, retention! *

There are various causes which give rise to this affection. Among these, enlarged prostate is the most frequent. We have only to consider that form which depends on stricture of the urethra.

In the treatment of a case in which the urine flows involuntarily, the first point, therefore, is to ascertain whether the bladder be empty or distended. In the latter case it sometimes forms a tumour, which gives an absolutely dull sound on percussion as high as the umbilicus, communicating to the hand a sensation something like to that of an enlarged uterus beneath the abdominal parietes, and the patient is astonished to learn that his urine has been abnormally retained, as he naturally enough supposed the converse condition to be the case. The treatment consists in emptying the bladder by the catheter, which of course must be adapted to pass through the stricture, and this must be done frequently at periodical times, so as to prevent distension, and favour an habitually-contracted state of the bladder.

We cannot be too strongly impressed with the necessity of looking for the presence of retention in all cases of urinary obstruction. The oversight of it by the attendant has sometimes cost the patient his life. Such a case, which came beneath my own observation for the first time after death, is recorded at the end of this chapter. (Case No. 21.) It is an exceedingly instructive one. The retention may be partial, and no overflow may co-exist, the patient habitually passing a portion only of the contents of his bladder, and leaving therein some ounces, which become stale and inflict injury upon the mucous membrane in contact with it. This state of things it is exceedingly important to detect, and it will often be found to exist

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* I have discussed this subject at length in my work on "The Enlarged Prostate, its Pathology and Treatment," chap. v., to which the reader is referred for an examination of the phenomena of Retention, Engorgement, and Overflow, on the one hand, and of the opposite condition of Incontinence on the other; which are better illustrated in cases of enlarged prostate than in those of stricture of the urethra.

although perhaps not suspected, if the experiment of introducing the catheter be made shortly after the patient has passed water.

COMPLETE RETENTION.

When any degree of organic stricture exists, however small, the possibility of an occurrence of complete retention of urine, at any time, is always to be apprehended, if exposure to the influences of certain exciting causes takes place. What these causes are have already been considered. The resulting local condition is occlusion of the passage, generally at the point of stricture, either by inflammatory engorgement, unwonted muscular contraction, or, as I believe most commonly happens, by a combination of both. Lastly, retention may be caused by the presence of some foreign body, carried to the stricture by the stream of urine in the form of a small calculus, a portion of membrane, or the like, obstructing the otherwise open passage, and this is probably the rarest form.

TREATMENT.—In treating a patient suffering from absolute retention, in nine cases out of ten, the silver catheter is the first, and often the only means required. One or two inquiries at the most, or even a glance at the patient, will generally suffice to determine the first point to be ascertained, viz.—is it a case of merely temporary obstruction, depending upon acute inflammation following an attack of gonorrhœa, or is it a retention supervening on organic stricture of some standing? The next points to be ascertained are the duration of the attack, and the condition of the bladder by percussion, always remembering that while a young and healthy subject may exhibit absolute dulness almost to the umbilicus from distension of that viscus, the subject of an old stricture may be in a state of much greater danger from distension than the former, although no dulness is perceptible above the pubes from the contracted condition of the bladder, which is now natural to him. Two or three minutes' examination will supply all the particulars it is necessary to be acquainted with. In all cases the object to be affected as speedily as possible, compatibly with the safety of the patient, is evacuation of the pent-up urine.

Next comes the inquiry, how is this to be accomplished? Should the treatment vary materially in the two cases just briefly described?

In some respects doubtless, but not greatly. Take the first case, that of temporary inflammatory obstruction. Such an one is liable to occur after a sudden check to a gonorrhœal discharge, or from indulgence in free drinking, or in venereal excesses, before such a discharge has been cured.* The subjects are generally hale and strong young men. On examining the penis, it is probably hot and tender to the touch, the lips of the meatus are red and tumid, and some purulent discharge may be apparent. It has been recommended in such cases to employ baths, opium, and depletion, before having recourse to the catheter, and there is no doubt that relief may generally be afforded in this manner, although at the expense of very considerable and prolonged suffering on the part of the patient. The advocates of the "constitutional" plan state that great injury may be inflicted upon the urethra in its inflamed condition by the catheter, which is thus avoided. This also is true, but if the surgeon has been tolerably practised in its use, and above all, if he will be cautious and gentle in the management of it, the anxiety on that point is needless. No doubt but that a hot bath, a good dose of opium, and a full cupping on the perineum, will greatly facilitate the passage of an instrument, or even render it unnecessary; one who is unaccustomed to use the catheter has, therefore, a better chance of success from these than by instrumental interference at the outset.

As a rule, I am in the habit of selecting a No. 4 or 5 silver catheter, well warmed and oiled. Such an one occasions less pain than the gum catheter, although the latter is almost invariably recommended by writers, since the metallic instrument is smoother, and therefore passes with the least possible amount of friction, and because it can be maintained in the proper direction. The course of the urethra is not altered in this condition, therefore why should we use a flexible instrument, since such an one has a tendency to become straight when warm, and consequently to hitch on the floor of the canal, and if the stilette be used for the purpose of rendering it inflexible, the silver instrument is of course preferable for the reason just named. As regards the size, less pain is caused by one of medium size than by a small one, which occasions severe cutting pain in the sensitive state of the urethra, produced by acute inflammation. In endeavouring now to insinuate it into the bladder, it will appear to be more or less firmly grasped throughout the whole of its passage, a sensation which the operator must not resent by force. Waiting patiently at every point of obstruction, endeavouring to overcome it by gentle continued pressure, not fitful but steady, bearing in mind, as at all times, rules before given, which it is unnecessary to repeat here, a gradual and slow advance may almost certainly be made. These are cases in which we should often succeed without resorting to other treatment. However, if the obstruction is not overcome by gentle catheterism, the hot bath should be employed *for the whole body*, and the urethra permitted to remain untouched for a time. The temperature should not be less than 102° or 104°. The effect of this is to relieve the local congestion by filling the vessels of the skin and inducing copious perspiration. A state of faintness is or should be induced also, which favours the relaxation of muscular spasm. Hence it is not uncommon to find the patient passing his water in the bath. But if this does not take place in about twenty or thirty minutes, and that after maintaining or augmenting the temperature so as to ensure the full effect of the bath, he should be removed, wrapped in hot blankets, to bed. A full dose of the liq. opii sed., say twenty-five or thirty minims, may be given by the mouth, and thirty or forty in an enema of about two ounces of gruel. Opium is often of great service, and probably in this manner: the powerful efforts to make water which accompany retention are, as has before been shown, to a great extent involuntary. There is no doubt that they operate prejudicially, since as soon as they are allayed the urine will sometimes flow as it were spontaneously. Some patients are quite sensible of this, but, nevertheless, have no power to control them. Opium tranquillizes the system, and the straining ceases. Undoubtedly if the operator is not expert in the use of the catheter, and in some cases if he is, opium is the safest remedy. Mr. Skey says, "there is nothing at all comparable to it in the great majority of cases."* If a hale and hearty subject especially, a full cupping on the perineum is beneficial. Six or eight ounces is a common quantity to remove; a practised cupper will get ten or even twelve, but one who is not may fail in obtaining four, with twice the time and labour. Cupping is better than leeching, inasmuch as it makes a more rapid and decided impression. Nevertheless, twelve or twenty leeches may be advantageously used in circumstances in which cupping cannot be employed. Supposing that about two hours have now elapsed, in the majority of such cases, considerable relief will have been obtained by the passage of some urine, although probably in a small stream. A smart and active purge should be administered, such as a drop of croton oil, or a colocynth enema, so that rapid and efficient action of the bowels is provided for. When this occurs, the stream of urine accompanying the evacuation will most likely be tolerably free.

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* See Cases, Nos. 1, 2, and 3, page 144, *et seq.*

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* Lecture at the College of Surgeons, May, 1854.

But supposing that no relief followed the cupping. At all events it is evident that the condition of the urethra may have been improved by it, and it is extremely probable that the catheter may be employed with success after the depletion. Should, however, further adjuvants be required, another dose or two of opium, during two or three hours of rest from other interference, will probably afford the desired relief.

The bladder will bear a good deal in such cases. Rarely, if ever, is it necessary to resort to other operative measures for its relief beyond those already detailed. The consideration of these will come hereafter. Some modification, however, of the treatment described may sometimes be necessary in the second class of cases, viz. those in which retention supervenes upon an organic stricture of some standing. Such as these form the examples of retention ordinarily met with. The instances in which no organic constriction has pre-existed are much less common. It may be difficult, perhaps, always to ascertain what is the immediate excitant of the attack: exposure to cold, the use of an unwonted kind or quantity of liquor, and violent exertions, are frequent causes.

We should begin by choosing a catheter which will acquaint us with the situation and condition of the obstruction, as No. 7 or 8. The patient will, most probably, be able to say what is the habitual size of his stream, and what instruments have been used in any previous treatment he may have received, together with some other fact which it may be useful to know. Having ascertained the locality of the stricture, we should devote some time to a patient and careful trial with two or three instruments of the smaller sizes. Even if the stricture is not passed, it is not an uncommon thing for a small quantity of urine to flow when the catheter is removed, after continued pressure has been made, more especially if the extremity of the instrument entered the stricture at all, and was held there.

Supposing, however, the trial to have been unsuccessful, the hot bath must be resorted to without delay, in the manner described two or three pages back, and after faintness has been induced, the catheter may be again employed while the patient is still in the bath.

Further treatment, if necessary, must depend upon the condition of the patient. If sufficiently strong, not old and debilitated, cupping will be useful. Generally, it will be desirable soon to bring him under the influence of opium, which should be given by enema and by mouth, after which the catheter is again to be used. Purging is a useful means, but a period of some hours must elapse before it can become available. It is not admissible in weak and broken-down subjects, and interferes with the administration of opium, which is usually of much more benefit in these cases. The time which is to be devoted to the employment of all these means, must be regulated by the judgment of the surgeon. The condition of the patient, and a knowledge of the time during which absolute retention has existed, will enable him to decide the question of affording relief by some other measures. Generally speaking, however, this is not often necessary. The treatment described will most frequently effect partial, if not complete relief, and render severer operative proceedings unnecessary.

Respecting the employment of the tinct. ferri sesquichl., which formerly, at all events, was regarded by some almost as a specific in cases of retention, I cannot say much. It has appeared to be useful in some cases, but is rarely now relied upon sufficiently to enable any trustworthy observations upon its powers to be made. Such have been instances in which the retention has seemed to be due more to spasm than organic constriction. The dose usually given is from 15 to 20 minims every ten or fifteen minutes for about an hour, in which time any favourable results it could induce might be expected to take place. Of the rationale of its action, I have nothing to offer. Possessing other means, in which much greater confidence may be placed, it may be deemed a remedy of little importance.

Now for either of the two cases described, there remains an agent, the value of which has been proved to be often exceedingly great; one which may to a great extent supersede the slower methods by the bath and opium; and although mentioned here, at the end of a list of remedial means, is not therefore necessarily to be reserved until others have failed. I refer to the administration of chloroform. Recommending it as I did six years ago, on account of the success in a few trials which had at that time been given to it, I can now speak with still greater confidence and satisfaction, from the result of a much larger observation of its powers. It has even happened, after employment of the catheter in the most able hands, that chloroform has been administered as a last resource, and that the urine has been spontaneously expelled with force, and in a fair stream, as soon as the patient has become fully subject to its influence. One such case may be referred to as recorded in the "Monthly Journal of Medical Science," March, 1852, by the late R. W. Mackenzie, of Edinburgh. Such a result is not a surprising one. But there is little doubt that, in many cases where such a result does not take place, the use of the catheter is greatly facilitated, while the patient is spared some pain, especially by being prevented from exerting those involuntary efforts of resistance which are often provoked by the instrument. It is easy to conceive that the muscular relaxation, induced through its agency, may be as available in many cases of retention as it already is in the reduction of dislocations, and of herniæ. For many cases we possess in anæsthetic agents all the advantages of the bath and opium united, and that in a much more easily employed form.

But supposing all our efforts to have been unsuccessful; that the bladder is not relieved; that retention has persisted now for some hours; what is the next course to be adopted?

One thing only remains when all other treatment has failed, viz. to make an artificial opening either into the bladder or the urethra.

Now let us consider what are the conditions, on the part of the patient, which warrant us in performing any of the operations in use for the accomplishment of this object. Much difference of opinion exists respecting it, and much variety in practice. It is notorious that there are hospital surgeons of extensive experience, who have never performed any such operation for the relief of retention at all. Others are equally well known to have done it ten, twenty, and even thirty times. For example, in St. George's Hospital, there has been no case of operation during twenty-five years. In Guy's Hospital, on the other hand, as many as thirty-six cases of puncture through the rectum have taken place during the past six years.* Is this dissimilarity in practice attributable to any difference in the class and character of patients who frequent the two hospitals in question? That a difference does exist there can be no doubt. The neighbourhood of the Borough Hospitals supplies a vast number of neglected patients of the most dissolute and intemperate habits, and it cannot be doubted, but that the population of the banks of the Thames, including as it does a large proportion of sailors, affords more numerous and more aggravated examples of the disease, than that which inhabits the western districts of the metropolis. But an inference must not be too hastily drawn from this fact. What is the experience of the officers of the London Hospital? an institution, the patients of which belong usually to a class, which may at least vie with those of Guy's, in point of degradation of character and habits. Here an operation for the relief of retention has not occurred twelve times in a period of as many years. Mr. Liston states, that the operation of puncturing the bladder by any method, was not performed in the Royal Infirmary, of Edinburgh, during the whole period of his official connection with it; nor during that of his association with University College Hospital. In reference to that, as well as to the method of relieving retention by perineal section, he says, "the cases requiring either proceeding will be rare indeed, if the mode of using a catheter be properly understood." * Other illustrations need not be cited from the practice of our metropolitan hospitals. Enough has been adduced to show that surgeons entertain widely-differing views, with regard to what is to be considered the warrant for resorting to operative measures in these cases.

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* The date of these remarks was 1852.

I shall endeavour to indicate what may be deemed to be the most judicious course of proceeding, as far as this can be done, in relation to the treatment of cases where, after the consideration of the peculiarities of each, something may depend on the relative qualifications of the surgeon, for the solution of the difficult and complex problem which a case of very obstinate retention invariably presents to his notice. It is often a most delicate and responsible duty to decide what that course should be. Each case must be judged of, not in strict accordance with any rules that books can give, but by its own individual characters. The physical powers of the patient; his age; the condition of his renal organs in particular, as far as this can be learned; the amount of suffering which he endures; the effect of medicinal agents upon him. All these should be known, at least they are necessary data to the formation of a correct opinion.

I alluded just now to the relative qualifications of the surgeon. It may not be forgotten, that a certain mode of treatment will be infinitely more safe in the hands of one man, than it would be in those

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* "Practical Surgery," 4th edition, pp. 484, 487.

of another; while the latter may possess dexterity in the use of an instrument which, in the practice of the former, may become rather prejudicial than otherwise.

Thus, can it be questioned, that the surgeon, who is accustomed to regard his catheter as the "*dernier ressort*," the final appeal among operative proceedings, will not effect more success in its use, by patient careful efforts, with his well-trained hand, than he who uses it under the abiding impression that the knife or the trocar are simple, and almost harmless substitutes in case of failure? I am not, at this moment, admitting or denying the correctness of this opinion respecting the latter practice, but only asserting a most palpable truth, that the man who trusts most to his catheter will use it best.

There are some surgeons who appear to think that as long as a patient, under the influence of complete retention, presents no very urgent constitutional symptoms, it matters little how much his bladder be distended, an almost indefinite amount of endurance being ascribed to that organ. That this is very great, is not to be denied, and the extreme rarity of rupture from this cause, which at length takes place, as we have seen rather by ulceration than by mechanical extension of its coats, is invariably referred to as evidence in favour of such an opinion. But it is certain that very mischievous consequences may result from extraordinary distension (rupture of the urethra and extravasation of urine being passed over, as sufficiently obvious), in its effects upon the kidney, not merely in the way of temporary interference with the performance of its function as a depurating organ; but in the lasting injury which it is conceived that a few hours of extreme pressure and dilatation may exert on its structure. This is so much the more readily susceptible of injury, as compared with the bladder, as the secreting organ exceeds the muscular reservoir, in complexity, delicacy, and intricacy of construction. We may not, therefore, continue safely our baths, opium, purgation, &c., to the extreme limit of endurance on the part of the bladder. Our care for the patient must extend beyond that point, and if from his history or condition we have reason to believe in the existence of organic renal disease, or only to suspect its presence, we shall not be warranted in quietly waiting beyond the time necessary for the exhibition of appropriate medicinal treatment, and the careful use of the catheter, for all of which a very few hours will suffice; supposing, it is of course understood, that his powers of life at first permitted of the pursuance of that course. In doing this we must be careful to watch the effect of any opium given. Very large doses may be administered to such patients without producing its specific results; while, on the other hand, coma may occur unconnected with the use of the drug, from that contaminated state of the blood which ensues from the non-elimination of the urinary principles.* We must not expect to find in all cases a bladder inordinately large, and giving the physical signs of dulness as far as the umbilicus, or even at all above the pubes. The contraction of the viscus from disease may not permit it to rise beyond the latter limit. Thus, in some of the worst cases, as seen in the section on pathology, more urine has been contained in the dilated ureter and pelvis of each kidney, than the bladder could be possibly made to hold. We must, in connection with all these signs, narrowly watch the pulse of the patient, and take into consideration his age and powers. The time which may have elapsed since he last made water, is by no means exclusively to guide us; as thirty hours of retention, in some cases, will be more easily borne than twelve in others. The old and enfeebled generally possess smaller powers of capacity, and distension much sooner tells on the kidneys; and these again are much more liable in such patients to be atrophied or otherwise diseased. Nor are we to imagine that a small quantity of urine dropping away at times, is to be regarded as sufficient relief. This may occur, and yet imminent danger may exist, as manifested by the general symptoms. Thus the presence of severe abdominal pain or tenderness, a wild and excited manner, are signs full of import and strongly indicate that time is not to be lost. Lastly, if we know that the stricture *has been already subjected to much instrumental interference*, a fact of no small importance, since it may have rendered present success by means of the catheter wholly impossible, or that retention is obviously not the result of inflammation or of spasm only, which probably the non-success of the previous constitutional treatment will have demonstrated; we shall be justified in making a direct opening into some part of the bladder or urethra.

It will be almost unnecessary to premise that if, in a fit of straining, the urethra has given way behind the stricture, and urine be extravasated, we need not necessarily make an opening *directly* into the urethra; the treatment in such a case, however, will engage our consideration hereafter. Again, the retention may depend upon the existence of deep perineal abscess, the possibility of which occurrence should not be forgotten. It is one which should always be closely looked for in all cases of retention from stricture, remembering that the existence of even a considerable collection of this kind, by no means invariably gives very marked signs of its presence in the perineum. (See Case 20, at the end of this chapter.)

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* See Case No. 21, at the end of this chapter.

Taking it for granted, then, that neither of these conditions exist, we have now to enquire what operation shall be performed for the purpose of relieving the patient. The following modes have been pursued:—

I. "FORCING THE STRICTURE" by the catheter.

II. INCISION INTO THE URETHRA, at or behind the seat of stricture.

III. PUNCTURE OF THE BLADDER.

1. By the perineum.
2. By the rectum.
3. Above the pubes.
4. Through the pubic symphysis.

I. With respect to what is called "FORCING A STRICTURE," an opinion expressed respecting it must depend on what is intended to be comprehended by the term.

Any proceeding depending alone on the amount of force communicated to a blunt metallic body in the urethra, can of necessity only be described by words in an indefinite manner, as no precise idea can be conveyed to the mind respecting the degree of force which different operators may use, or desire to express by the terms, "moderate," "firm and steady pressure," &c. If they intend only so much pressure as will dilate the strictured part, and not so much as will tear the canal and make a false passage; it may be taken for granted that ordinary catheterism should include all this, and that it would be extremely fortunate if it never embraced any proceedings of a harsher character. But if forcible catheterism mean the determined pushing onwards of an instrument in the presumed direction of the urethra, whether in or out of the canal, until the bladder have been reached, no matter through what tissues the passage be channelled, then the sooner so barbarous a procedure is expunged from the list of surgical operations, the more creditable will it be to the art of surgery. Nevertheless, the forcible opening up of a stricture in order to relieve retention, was preferred to all other modes by Desault, who gives precise instructions for its performance,[*] and who, during his long experience, only once punctured the bladder: also by Boyer, who especially advocated the use of the "sonde conique d'argent," a conical and almost sharp-pointed silver catheter, with a stilet accurately filling its cavity, in performing the operation.[†] Both deprecated the making of false passages, yet used very considerable force, always maintaining the left index finger in the rectum in order to guide the catheter. Roux also, in early life, followed the same practice.[‡] However, fresh experience, improved instruments, and chloroform, have happily rendered this method almost obsolete at the present day.

II. Perineal Incisions.—The next mode is that by which the urethra is laid open from the perineum, just anterior to the anus. There are two methods of doing this. The first, in which a dissection is carried down to the stricture, and through it, if possible, thus making a way into the urethra behind; the other, in which an opening is made directly into the urethra behind the stricture, followed or not by division of the latter, according to the judgment of the operator. The former proceeding, or that of perineal section, has been already fully described at page 264.

The advantage claimed for the adoption of this method is, that it combines in one operation the relief of the urgent condition, and the cure of the stricture. And it is unquestionably a great advantage when these results can be attained. It cannot be regarded, however, as one by any means of universal application. Simple as each step of the proceeding appears in words, it is by no means always so easily practicable on the patient. The great difficulties met with occur, for the most part, in those instances in which the urethra is considerably contracted for a large portion of its track; where the perineum is much thickened and indurated from abscess and fistulæ, as it so often is in old and chronic cases, when any active inflammation of those parts accompanies the retention; and when the constitutional state of the patient is incompatible with the shock of a severe and prolonged operation, or with the loss of blood to which he may be liable, although considerable hæmorrhage is by no means a necessary occurrence. In these cases it is often exceedingly hard to follow the track of the urethra at all; it is exceedingly easy to grope widely from it, among parts in an unnaturally hardened and deformed condition, and especially to go too deeply, and dissect beyond the canal altogether. It has been known to fail in the hands of men of skill and reputation. A considerable time is often spent in accomplishing the opening into the urethra, and the catheter may not be carried into the bladder immediately after the operation, or for a day or two after, or even at all. A case occurred not very long ago, in very able hands, and which therefore is a fair, as it is by no means a single, illustration of the results which may sometimes follow its performance. The patient was an elderly man, and his case was unpromising, and likely to prove a fatal one under any circumstances. The operation was done in the manner described, but it occupied much time, and appeared unsatisfactory in its results. The catheter was passed, as it was supposed, into the bladder. Very little urine, however, issued, and he died in a few hours. At the post-mortem examination, it was discovered that the catheter had entered the urethra at the membranous portion, but had left it immediately through the anterior wall, to find its way in an upward direction between the bladder and the pubic symphysis.

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[*] "Œuvres Chir. Desault." Paris. 3rd edition, vol. iii. p. 244. Par Bichat.

[†] "Traité des Mal. Chir.," vol. ix. p. 232. Paris, 1824. This instrument is engraved in "Sketches of the Medical Schools of Paris." By J. Gross. Lond., 1815.

[‡] "Relation d'un Voyage fait à Londres." Paris, 1815. P. 315.

The second method of opening the urethra from the perineum, viz. by an incision made altogether behind the stricture, has been before referred to, as one which has been long resorted to by surgeons for the purpose of relieving retention of urine. Of late years it has been especially recommended in this country by Mr. Guthrie, and as it is impossible to offer a more detailed and practical description of the operation than that which he has given, I shall not apologise for quoting his directions at length.

"The patient being placed as in the operation for the stone, a straight grooved staff or sound is to be passed down to the stricture, and held steadily against it. The rectum having been previously cleared by an enema, the fore-finger of the left hand being duly oiled, is to be introduced into it, and the state of the membranous part of the urethra and the prostate is to be carefully ascertained. The principal object in introducing the forefinger is to ascertain the relative situation of the upper part of the rectum and the urethra, which latter part is only in direct application to the rectum near the termination of its membranous part and the commencement of its prostatic portion. There is a certain distance which is greater or less in different individuals between the last inch of the rectum and the urethra placed above it. The two parts form two sides of a triangle, the apex of which is the prostate, the base the external skin, and it is within the two lines of the triangle that the operation is to be done. The surgeon, taking the grooved staff, or sound in his right hand, whilst the forefinger is applied to the upper surface of the rectum, moves the point steadily upwards and downwards, so as to convey to the forefinger of the left hand a knowledge of the situation of the extremity of the instrument, and particularly of the distance between them, and which the motions given to the instrument by the right hand will clearly indicate. The thickness of the parts between the obstruction and the rectum can thus be estimated with sufficient accuracy, both at the point where the left forefinger is applied, and at the surface of the skin; for although the membranous part of the urethra cannot be easily felt from an incision made on the left side of the perineum, it is distinguished in the plainest manner from the rectum. The next step of the operation is to divide the skin, cellular membrane, fascia, muscular and tendinous fibres, which intervene between the upper surface of the rectum and the under surface of the anterior and middle portions of the membranous part of the urethra. This is to be done by a straight, blunt-backed, narrow, sharp-pointed bistoury, fixed in its handle; the point of which is to be placed on the skin, a little above the verge of the anus, the cutting edge being upwards, the blunt back towards the rectum, the handle being a little depressed, the point somewhat inclined upwards. The degree of inclination necessary to carry the knife inwards for the distance of an inch, and clear of the rectum, will be indicated by the finger in that part; and the eye of the operator should correspond with the point of the forefinger in the rectum, so that the bistoury may be steadily pressed in to that extent, then carried upwards, and brought out in the exact median line, making an external incision of at least an inch and a half to two inches, or more if necessary, as regards the external parts. If the perineum is much hardened, and consequently unyielding, a transverse, curved, or crescentic incision should be made across it, the centre of which should correspond with the raphé, and be half an inch above the verge of the anus, or as near that distance as may be, with due regard to the safety of the rectum. The surgeon may then deepen the cut without fear, for the forefinger in the rectum will always inform him where the back and the point of the bistoury are. The opening will now be sufficiently large to allow the operator to lay aside the knife, and to feel for the urethra with the point of the forefinger of the left hand, keeping the end of the staff steady against the stricture, which will be readily felt, and through which the instrument will now sometimes pass with a little pressure. If it should not do so, the knife is to be resumed, and the forefinger being placed in the wound, on the outside of the rectum, which is to be depressed as much as possible, the back of the knife is then to be turned to it, and whilst the patient strains, the point should open the urethra, which it can do very easily, as far back, if required, as the apex, or transverse portion of the prostate. It will not be necessary, however, to go so far back, and the membranous portion may be opened at its middle or anterior part with perfect safety. A probe should be introduced into it whilst the urine is flowing." . . . .

"If the membranous part of the urethra should be dilated, an opening is more easily made into it, but this must *not be expected, as it rarely takes place.* The patient should, therefore, be desired to make an effort to expel his urine, that the surgeon may have the advantage of feeling the distending effort with the point of his finger, as he opens the urethra. If the operation has been performed for retention of urine, the safety of the sufferer is ensured, and nothing more need be done; but as the patient, in submitting to an operation, expects that the original cause should be removed, reference must be had to the stricture, which is, in all probability, half or at least a quarter of an inch distant from and above the opening which has been made to evacuate the urine. The grooved sound or staff, in the anterior part of the passage, is now to be firmly pressed against the stricture, whilst a curved probe or director is, if possible, to be passed upwards, as far as it will go, to meet it. The operator has then the choice of dividing the strictured or obliterated part, upwards or downwards, as he pleases." *

The method thus described is especially applicable to cases of retention, and may generally be adopted with advantage where a simple perineal opening is considered desirable in preference to the perineal section, strictly so called. It is superior, inasmuch as to a person who possesses the requisite anatomical knowledge, and who has given due consideration to the relations of the important organs which occupy the pelvic outlet, without which he is unfit to perform any operation in this part at all, it is a more easy matter to hit the urethra behind the stricture by a direct incision anterior to the anus, than it is to grope after the urethra at the point of stricture, and dissect backwards through it, or by it, in search of the canal behind.

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* "Guthrie's Lettsomian Lecture." London, 1851. Pp. 29, 32.

Independently of the evidence of experience on this question, this method of proceeding is warranted by what we know respecting the common situation of strictures. Adverting for a moment to the result of researches made in connection with the subject, (page 83,) we find that the bulbous portion of the urethra is the most favourite situation for organic stricture. Most rarely is any stricture found in the membranous portion, and never in the prostatic portion. Consequently the urethra is always free from contraction at the point at which it is possible, with due care, to open it, so that in no case is there any danger of not operating completely behind the stricture.

It gives the surgeon also the option of performing a simple operation for the purpose of relieving the bladder, without necessitating that of dividing the stricture as well, which it is not always desirable to do, since the existing circumstances of the patient may by no means be the most suitable in which to perform it, indeed may contra-indicate the employment of any incision beyond what is actually necessary to secure the former purpose. In this case, having made an opening from which the urine issues, before withdrawing the knife, a grooved director, wide towards the handle and tapering towards the opposite extremity, should be passed into the bladder by the side of the blade, which should then be brought out, enlarging the opening slightly if necessary at the same moment; the grooved director will admit of a female catheter being passed along it, which is then to be retained in its place. These precautions are nearly identical with those which Mr. Guthrie gives. They are to be insisted upon as necessary, in order to secure the proper introduction of the catheter, failing in which, the patient may be very awkwardly situated.

Sir Charles Bell recommended and practised this operation in those cases in which the urethra was dilated behind the stricture, a condition which his experience led him to believe was more frequent than the converse. Moreover, he regarded it as generally more safe, on the ground that while it is tolerably easy to distinguish the prostatic and membranous parts of the urethra from the rectum, and thus to guide the point of a bistoury into the latter; it is exceedingly difficult to distinguish either, by the finger placed in an open wound made in the perineum for the purpose. This is a conclusion at which he arrived after considerable experience,* and I think its force will be felt by all who have employed their sense of touch in the circumstances last described.

Mr. Liston arrived at a precisely similar conclusion, and probably by the same process of experience. Having described the mode of relieving a distended bladder by cutting upon the obstruction, he says:—"Or better, the forefinger of the left hand is introduced into the rectum; a straight bistoury having been pushed into the mesial line with its back towards the bowel, is carried onwards to the apex of the prostate, and in withdrawing the instrument, the dilated passage is opened to the point of a catheter passed down to the obstructed point. This is preferable to puncture of the parietes of the bladder in any situation, but the cases requiring either proceeding will be rare indeed, if the mode of using a catheter be properly understood."† Although he never performed this operation for the relief of retention, he resorted to it several times for the relief of impassable stricture. On one occasion only did he perform an operation for retention, and he then selected puncture of the bladder per rectum, considering the method just described as contra-indicated. (See page 270, note.)

III. Puncture of the Bladder.

This has been performed in four ways:—by the Perineum—above the Pubes—by the Rectum—and through the Pubic symphysis.

1. The operation by the perineum is now obsolete, and happily so, since it is far more uncertain and dangerous than the others. It was mentioned by Rhazes in the tenth century, and by Serapion also; it was occasionally practised perhaps at that time, although no subsequent record appears of it until the seventeenth century, when the practice of cutting upon the point of a grooved

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* Clinical Lecture in "Medical Gazette," Nov. 29, 1834. By Sir C. Bell.

† "Practical Surgery," 4th edition, p. 484.

staff, and pushing on a gorget in the presumed direction of the urethra, into the bladder, was substituted by the Dutch and French surgeons.[*] An incision through the integuments was first made directly in front of the anus, or obliquely to the left of it, as in lithotomy, but of less extent; and pressure being made above the pubes by an assistant's hand, in order to steady the bladder and render it tense below, a trocar was thrust in the direction required. It was sometimes introduced by the side of the prostate into the bladder, at other times it was carried through that organ. The tube was afterwards retained in the wound, and the latter was plugged with lint to prevent hæmorrhage. The most recent account of the mode of performing it is by Sir A. Cooper, who states it to be "the most difficult operation of the three," and advocates the method of opening the urethra behind the stricture, in the median line, an operation which had often enabled him to dispense with that of puncturing the bladder.[†]

2. THE PUNCTURE BY THE RECTUM.[‡]

The present usage is to open the bladder either by the rectum or above the pubes. Each operation has been a favourite one with certain surgeons. Neither should be adopted to the entire exclusion of the other. An effort has of late been made, mainly by Mr. Cock, of Guy's Hospital, to test the value of the former method. Accordingly he has embraced every means of ascertaining its value, and during the last few years has punctured the bladder per rectum, no less than twenty-four times at least, and has had the opportunity of witnessing the operation, and recording its results in at least a dozen other cases. The body of evidence so collected, Mr. Cock has placed before the profession, and invited their judgment upon it, affirming that he believes it to be one fraught with less danger, and more easy of performance, than any other which is adopted for the relief of retention.[§]

The chief objections which have been raised against it are, the averred liability to the occurrence of abscess between the rectum and the bladder as an after result, the persistence of fistulous opening there; the infliction of injury upon the seminal vesicles, leading to inflammation of these and the neighbouring parts, including the testicle; and the danger of perforating the peritoneum with the trocar, and thus setting up inflammation of that membrane. All these results have undoubtedly been met with. One or two instances, perhaps, of each, might have been recorded here; I have even known suppuration of the testicle from inflammation to be thus caused. Of all the dangers apprehended, that of wounding the peritoneum appears to be the least likely to happen if ordinary care only be employed. The bladder in rising carries its peritoneal coat along with it; and it has been observed in the examination of those cases where the parts have been preserved after death, that the puncture has almost invariably fallen short of the peritoneal fold, an inch, or an inch and a half. The vesiculæ seminales, or the vas deferens, appear to escape somewhat less frequently. Injury to either of them is a less serious matter than to the former. The operator, however, must carefully endeavour to maintain the middle line in order to avoid them. But Mr. Cock's practice seems to have been remarkably free from these complications, and it is but fair to believe that the dangers of the rectal operation have been overrated. Having carefully examined the reports of forty cases, as given by that gentleman in the paper referred to, I find seven or eight deaths following the operation; but no evidence that these were caused by it. In five cases, the patients had suffered from stricture for very many years, and in all, advanced renal disease existed. In *none* does it appear to have arisen from any of the causes hitherto alleged to be sources of danger.

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[*] J. Riolanus, "Encheirid. Anat." Lugd., 1649. Lib. ii. chap. xxx. p. 154. Colot, Tolet, Petit, Ledran; quoted at pp. 257–259. Dionis, "Cours d'Oper." Paris, 1716. 2nd édition, 3eme demonst. Heister, "Inst. Chirurg." Amst., 1739. Chap. 144, sect. ii. pp. 1009–1011.

[†] "Lectures," edited by Tyrrel. 1825. Vol. ii. p. 314.

[‡] First practised by Fleurant, a surgeon in Lyons, in 1750.

[§] "Med. Chir. Trans.," vol. xxxv. 1852. P. 153.

Mr. Cock, moreover, states that the result of the operation is such an improvement in the condition of the urethra, in consequence of the urine having ceased to pass by and irritate it, that the reduction of the stricture by dilatation may be much more readily accomplished than before. This view has unquestionably been admitted by most who have had the opportunity of judging, and its correctness is borne out by experience. When the over-distension of the bladder is relieved, the stricture almost invariably relaxes more or less, and may permit the passage of some urine through it. At all events if this be not the case, the source of irritation, local and general, having been removed, the stricture will probably become permeable after a few days, a result which may be due to the subsidence both of congestion and spasm in the part constricted.

The mode of performing this operation is as follows:—Having had the rectum emptied by means of an enema, place the patient on his back in the position for lithotomy, and let him be firmly held by two assistants, not tied. Oil, and introduce the left forefinger into the rectum, ascertaining the size and situation of the prostate, beyond which the tip of the finger should be fairly carried, so as to define its posterior boundary; not always an easy thing to do when the bladder is much distended, since its neck becomes then considerably elongated. Fluctuation should be felt by it there, communicated, through the contents of the bladder, from a tap made on the hypogastric region, unless the viscus be very contracted indeed, in which case the performance of the operation is of doubtful propriety, since the point of the trocar may enter the opposite coat of the bladder, from absence of the requisite amount of distension, or do some other mischief.* Having found the spot beyond the prostate at which fluctuation is most distinctly perceived, and having directed an assistant to support firmly the lower part of the abdomen with both hands, so as to press down and steady the bladder towards the rectum, a well-curved trocar, seven or eight inches long, should be carried along the finger, directed strictly in the middle line to the part indicated, the handle well depressed, and the point carried through the coats of the rectum and bladder, until it is felt free in the cavity of the latter. The canula must be carefully kept ***in situ***, while the stilet is withdrawn, and afterwards retained there by means of a bandage and tapes.† The length of time it should be allowed to remain will depend on the amenability of the stricture to treatment. If this yields, the urine will most readily pass through the natural channel, and the opening in the rectum may be permitted to close. This quickly and readily takes place. Little fear need be entertained of the continuance of a fistulous opening, for on several occasions on which the canula has escaped by accident, it has been impossible to replace it, and a fresh puncture has been necessary. Even during its term of patency after the canula has been withdrawn, the urine does not continually distil through the opening, but distends the bladder up to a certain point, when contractions of the organ take place, and force it through the artificial opening. So readily indeed do these punctures heal, that it has been suggested by a surgeon, who has himself tapped the bladder several times, and has therefore had some experience of the results, in certain rare cases in which considerable irritation of the bladder is kept up by the continued presence of the canula, to make a fresh puncture every day, in order to avoid it. Whatever may be thought of the proposition, the facts I have stated are an indication that there is little disposition manifested by these openings to take on a fistulous character. It should be added, that Mr. Cock states that he has never met with an instance of this, at all events, not of its persistence after the permeability of the urethra had been restored.

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* Thus Mr. Cock relates one instance in which he punctured where the fluctuation, although discernible, was evidently small in extent. Only half an ounce of urine escaped at the time. A month after the patient died comatose, and it was discovered that behind the stricture, "a small part of the membranous, and the whole of the prostatic portion of the canal were dilated into a pouch resembling, in size and shape, an elongated hen's egg, and forming a sort of subsidiary anterior bladder. The bladder itself was enormously thickened, and permanently contracted into a ball, presenting no cavity whatever." The urethra forming the pouch was found to have been transfixed by the trocar, which passed through both its lower and upper walls. (Mr. Cock's Cases, No. 40.)

† In order to prevent the liability to slip from the bladder which attaches to the old canula, Mr. Cock has contrived one which can be made to expand somewhat after its introduction into the bladder, and with which there is less danger of the occurrence of this accident. He recommends the same form of trocar as that generally used, but "increased in length and thickness;" with one or two other minor but useful additions.—*See Med. Chir. Trans.*, vol. xxxv. p. 186, and plate.

There are certain conditions which must be held to contra-indicate the performance of this operation. The absence of fluctuation when examining the bladder through the rectum, as already noticed. This may be occasioned not only by a contracted bladder, but by a considerably enlarged condition of the prostate or by tumor connected with it. The incompatibility of the employment of the trocar from the rectum in such cases will be sufficiently obvious.

3. PUNCTURE OF THE BLADDER ABOVE THE PUBES is the next method to be considered.

The mode of performing it is as follows:—The patient being placed in a half-sitting, half-reclining position, and the pubes shaved, a vertical incision of the integument is made directly above the symphysis pubis, about an inch and a half or two inches in length at the surface; this is to be carried downwards through the linea alba, so as just to admit the tip of the finger to reach the distended bladder. Meantime, an assistant, standing behind the patient, should press one of his hands firmly on either side, against the abdominal walls in such a position as to steady the bladder. A straight, or a slightly-curved trocar (if the latter, the convexity of the curve should be upwards), is then to be carried with a very little inclination downwards into the bladder. It is better not to empty the viscus immediately, when very large, but to draw off its contents by degrees; as alarming syncope, and even death, have occurred on sudden removal of the pressure from the abdominal circulation. After the operation, the canula should be exchanged for a silver tube, specially adapted to slide through it, secured by tapes and a T bandage, which may remain a variable length of time, at all events until lymph has been effused upon the edges of the wound, when it may be withdrawn, and an elastic gum catheter worn in its place, an instrument which is generally better tolerated by the bladder than one made of metal.

4. Lastly, the PUNCTURE THROUGH THE SYMPHYSIS PUBIS.

This operation was first proposed by Dr. J. M. Brander, of Jersey, in Paris, in 1825, where he read a paper advocating the procedure on the presumed advantages of the situation, regarded anatomically.[*] Subsequently he presented a paper on the subject to the Royal Medical and Physical Society of Edinburgh, and afterwards to the Medical and Physical Society of Calcutta, recording a case.[†] Several successful cases have since occurred in the practice of Dr. Brander and others. One very recently, in that of a man æt. 72, was performed by Dr. Leasure, of Newcastle, Pa.[‡] Dr. Brander has employed a hydrocele trocar of medium size, although he alludes to one of flattened form. The first-named instrument offers an advantage by admitting of rotary movement in introduction. The patient should recline, and the trocar should be introduced—whether after a small preliminary division of the integuments or without it, appears to be immaterial—about the centre of the symphysis, reckoning from above downwards, and in a direction at about right angles to the vertical axis of the body. Dr. Brander says, "somewhat obliquely downwards and backwards towards the sacrum, varying the direction according to circumstances; a piece of flexible catheter is then to be introduced through the canula," and retained by a tape.

In considering these methods of affording relief to the distended bladder in reference to any case which requires an operation, the question to be first solved is the following:—

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[*] "Séances de l'Athenée de Médicine." 1825.

[†] "Trans.," 1842. Vol. viii. part ii. pp. 208–239. A case occurred in 1839, and another in 1841. The first patient died in a few hours, the second in about nine days, after the operation.

[‡] "American Journal of Medical Science." April, 1854.

Are the patient's powers and condition such as to compel us to prefer the simplest method of affording immediate relief, without regard to ulterior results? It ought not often to happen that we are called upon to answer this question in the affirmative, if the early treatment have been under our own direction, for it would indicate that other appliances have been too long employed. But then this is not always the case. The surgeon's decision is often required after protracted neglect or mismanagement, and when the patient's powers are at a low ebb. Well then, in such circumstances, unless the urethra can be felt in the perineum distended with urine, which may sometimes be the case, especially if that region be not thickened or deformed, the rectal puncture of the bladder, supposing the prostate not to interfere (putting aside the puncture by the symphysis as not yet sufficiently tested by experience, to be considered on equal terms with the older operations), is the simplest method, and will afford instantaneous relief at the smallest possible expense to the patient's powers. But if the bulging spoken of is perceived, a lancet, or sharp-pointed bistoury, may be carried into it, and a female catheter introduced by its side before it is withdrawn.

Supposing, however, that the powers of the patient are good, and that the condition of the perineum is natural, I certainly should prefer the method of introducing a bistoury into the membranous portion of the urethra guided by the finger in the rectum, as described. Having relieved the bladder, we can leisurely and carefully divide the stricture, either by introducing a fine probe from below upwards through the stricture, or not if it really be impossible, and passing a catheter through into the bladder. We have then the satisfaction of laying a foundation for the radical cure. Depend upon it, whatever may be said about the patency of the stricture, after relief to the bladder has been afforded, and its amenability to dilatation then, that if it be so obstinate and so narrow as to require the performance of an operation to relieve retention, it almost certainly belongs to that class of strictures which are most successfully treated by external division. Looking forward to the future well-being and comfort of the patient, there is little doubt but that the best thing is to divide the obstruction at once, provided the circumstances are favourable to the proper performance of the operation.

and not subject him afterwards to a long course of dilatation, destined, perhaps, after all, to be inefficient and unsuccessful.

Lastly, if such an amount of deformity and thickening of the perineum, before alluded to, exist, that the result of the operation there must be somewhat uncertain, and the incisions more extended than are usually required, it certainly is not the favourable time nor manner for performing it. It would be safer to tap the bladder, and reserve our treatment of the stricture for a future period, when freedom from the irritation of urine, and rest, and removal of the urgent symptoms, shall have induced a more favourable condition of it; and adopt that method which shall then appear most likely to be successful.

In closing this chapter on retention of urine from stricture, which has been discussed at considerable length, let it not be supposed that we should therefore regard it as a condition which very frequently requires either perineal division of the urethra or puncture of the bladder. On the contrary, it should indeed be rarely necessary when the management of the case from the commencement has devolved upon ourselves. If previous neglect or improper interference have existed, the failure of the surgeon who is called in may follow, but for this he is not responsible.

I have endeavoured, in the consideration of the subject, to provide as far as possible for contingencies, and have indicated a certain line of treatment for typical cases, as far as such can be delineated. But never be it forgotten, that every individual case offers a problem by itself, for the solution of which no rules can be positively predetermined, while some cases there are which can be brought under no category, and in which the surgeon must exercise his own independent judgment, and rely upon his own resources.

This assertion is a mere truism after all, applicable to the practice of surgery in all its branches, although in none is it more desirable to keep it in mind than when called upon to meet the varied exigencies which, in complaints of the urinary organs, are apt to arise.

EXTRAVASATION OF URINE FROM RUPTURE OF THE URETHRA.

An accident which may take place during unrelieved retention of urine is the giving way of the urethra at some point, and the consequent extravasation of urine into the tissues adjacent. Much more rarely the bladder itself is ruptured. In either case, however, mechanical distension is not the direct, nor the only cause. Ulceration of the mucous membrane behind the stricture, perhaps of some standing, has extended more deeply under the influence of the irritating fluid which is now in constant contact with it, and solution of continuity at length becomes complete under the influence of the morbid action and the distension together. The bladder contracting upon its contents drives them with great force into the cellular tissue, which readily yields, and from the extensive continuity of passage which exists, the urine rapidly finds its way in the direction by which it is unopposed by fascial partitions, and this takes place into the superficial fascia of the scrotum and abdomen, when the rupture occurs anterior to the membranous portion, as before described. The consequences of this are disastrous in the extreme. Inflammation is set up in the track of the noxious fluid, and the areolar connections of the skin and subjacent tissues are broken up. It is a sign of very unpropitious omen if the corpus spongiosum have become infiltrated; a dark spot on the glans penis marks its occurrence, and the progress of the gangrene which has resulted. When this fearful accident happens there have usually been attending circumstances of great neglect, and in which, therefore, the patient is probably seen by a surgeon for the first time, after the accident has occurred. The general condition of the system is one of extreme depression, and unless speedy relief be afforded, a fatal result must inevitably and rapidly follow. The phenomena presented by such a case have been fully described in the section relating to symptoms (p. 96), but the principal local signs are considerable distension of the parts involved, discoloration of the integument, the hue of which varies between dusky red and purple, and, in addition to these, pressure made by means of the finger occasions a kind of emphysematous crackling sensation in the worst portions, from the presence of gaseous products in the interstices of the cellular tissue, which is extremely characteristic. Lastly, the patient is frequently in a state of low muttering delirium, with black tongue, and pulse almost indistinguishable.

In these circumstances it is obvious that no time may be lost. Our first duty is to prevent accumulation of urine in the cellular tissues, and provide for its elimination from them by making incisions into the distended parts. The perineum, or the scrotum and pubes, are probably extremely swollen, and incisions will not only give vent to the extravasated urine, but provide for its direct passage from the bladder by the unnatural opening in the urethra. To effect this, it is best to make a free incision in the middle line of the perineum or scrotum, and others at points where there is much distension, and where sloughing of the subcutaneous connections is obviously taking place. Fœtid urine, puriform matter, and decomposed tissues come away, and sometimes in surprising quantity. Immediate operative measures for the cure of the stricture are not called for, as in the present state of the patient they are neither practicable nor advisable; and further, it is by no means improbable that when the retention is relieved a catheter may be passed into the bladder by the urethra. But there is no occasion to make any attempt to do this until the system has rallied, which it often does to a marvellous extent. In a few hours the sufferer may emerge from a state of utter prostration to one of comparative comfort and promise. Indeed the symptoms of depression and exhaustion sometimes disappear as by a charm, unless the injury inflicted has been too extensive to admit of repair. (See Case 19, page 343.)

The next point of importance is to support the sinking powers of the patient. The immediate exhibition of nutriment in its most simple, easily-assimilated, and yet concentrated form, is necessary, and with this a fair quantity of stimulant should be combined. Strong beef-tea, with the addition of brandy, the mistura vini gallici of the Pharmacopœia, frequently given in small quantities, as the patient can take them, are good forms for the purpose. If beef-tea of the required strength is not at hand, there need be no delay on this account, at all events here in London. The best portable or other plain soup should be at once obtained and administered until the home-made article is prepared. In most cases, also, the application of artificial warmth to the extremities will assist in bringing about the favourable issue.

The free use of cinchona in some of its forms is generally indicated. The chlorate of potash in doses of six to eight grains, in an ounce or two of well-made decoction of the red bark, and a couple of drachms of the tincture, may be given every three, four, or six hours with great advantage, if it can be borne. Ammonia, for a short time, appears to be sometimes serviceable. In other cases, especially where symptoms of nervous excitement appear, with extreme debility, the use of opium may be attended with the best results.

However favourably the patient progresses, a considerable amount of sloughing must often be anticipated. The connections of the skin with the tissues beneath having been destroyed, the nutritious supply is cut off, and its death follows as the necessary consequence. This is commonly the case with that of the scrotum to a greater or less extent. Both the testicles are sometimes completely stripped of their covering, and are seen bare in the wound, and even hanging by the cord. During this process the removal of the products of decomposition and the cleanliness of the parts must be provided for. Antiseptic applications frequently changed, as yeast or beer-ground poultices, linseed-meal poultices, with a few drops of the chlorides of lime or soda well stirred in, promote these indications. The use of the disinfecting chlorides about the bed and room is also exceedingly desirable, while a free current of air should be established through the latter. Lastly, bags of powdered charcoal placed about the bed serve to absorb the noxious gases, and so to purify the atmosphere in the most efficient manner.

If the extravasation have taken place between the two layers of the deep perineal fascia, a firm, hard, and deep-seated swelling may sometimes, but not always, be detected in the perineum. This is to be at once freely opened. If it occur behind the fascia altogether, but this is very rare, the urine finds its way upwards around the base of the bladder, and a fatal result is inevitable.

The most certainly fatal accident that can happen is RUPTURE OF THE BLADDER itself. This occurs by a process of the same nature as that which has already been described as affecting the urethra, although it may not always occur in the bladder, properly speaking, but in a thin and dilated sacculus springing from it. Occasionally the discharge of its contents takes place directly into the peritoneal cavity, more commonly into the cellular connections of the organ below the line of its peritoneal coat, after which it may secondarily escape through the peritoneum or not. In any case a recovery has never been known to happen, and cannot be regarded as possible.

The symptoms of vesical rupture take place after a prolonged but not necessarily absolute retention, for some surplus of urine may have been previously escaping by the urethra. The patient usually states that he has felt something give way. Acute abdominal pain then sets in; the belly becomes exceedingly tender and distended; the features are pinched and anxious; the breathing hurried; obstinate hiccough occurs, sometimes vomiting; the pulse is sharp, quick, and irregular; urine ceases to flow altogether, as also does the straining to void it. General fluctuation may be sometimes found in the abdomen, and inordinate distension of the bladder, before felt in the rectum beyond the prostate has now disappeared. Sometimes the patient is delirious, and even maniacal. And after a period varying from thirty-six hours to four or five days from the time of the accident, during which the patient's agonies are extreme, death takes place. This outline of symptoms is founded upon the reported histories of four cases—two pp. 351–3 (Nos. 24 and 25), and two by Sir Everard Home.

Treatment.—The indications which, in the absence of experience, we should endeavour to fulfil would be as follows: To provide for the free exit of the urine from the bladder by puncture; to alleviate suffering by large doses of opium, and hot fomentations and rubefacients to the abdomen; to abstain from depressing treatment, as general bleeding, which can be of no service in relation to the peritoneal inflammation as long as the exciting cause remains. Whether an attempt to remove this, in case of extravasation into the abdominal cavity, by puncture of its walls, should ever be entertained, could only be determined by a knowledge of the individual circumstances of the patient. Such a proceeding affords the only chance (exceedingly slender as it is) of recovery which surgical aid could afford.

Case XIX.

Stricture—Neglected extravasation of urine during six days—Enormous sloughing—Recovery.

J. S., æt. 45. A strong, hale countryman.

1855, Dec. 10.—Admitted to Marylebone Infirmary last night under my care. Stricture of seven or eight years' standing. *For the last six days* he has evidently been the subject of extravasation of urine, and has passed water by drops only. He has borne up against it until endurance was not longer possible.

Present state.—The penis is the size of an ordinary arm above the wrist; a black patch of slough on the right side, width of three fingers.

Scrotum much larger than a child's head; perineum undistinguishable, being involved in the swelling. Redness and swelling over hypogastric region, so that vesical dulness cannot be ascertained there, but by rectum bladder is felt much distended. Patient's condition low.

I made deep and free incisions through the sloughing side of the penis, two others, each four inches long, through scrotum. It was not possible to attempt catheterism. Ordered beef-tea and brandy—poultices.

Afternoon.—Thirty ounces of urine have drained through incisions.

Evening.—Bladder still tense from rectum; not much urine has passed.

I therefore carried a bistoury into the median line of the perineum, an inch anterior to the anus, to the depth of about two inches and a half, and immediately a quantity of fetid urine gushed out. An opiate ordered.

Dec. 11.—Relieved; but slough of penis increasing. Great discharge of pus and flatulent matter with urine. Right iliac and hypochondriac regions are hard and dusky red, and a blackish spot above the pubes. A free incision in each spot exposing sloughs. Continue stimuli, nourishment, and opiates.

Dec. 12.—Improving in general condition; urine comes away freely; but left iliac region and hypogastric region are sloughing. Two more incisions.

Dec. 13.—Urine has drained freely from the iliac and hypochondriac openings; all seem to communicate indirectly with the bladder by a large cavity into which the finger passes by the perineal wound.

December 14, 15.—Large masses of slough separating. Appetite returning. Takes much nutriment.

December 22.—Doing well. Very large sloughs have come away from all the parts involved, leaving one testicle bare, the corpora cavernosa also; and large gaps in hypogastric and iliac regions.

1856, January 15.—Wounds healing. A small stream now passes by urethra, chiefly by perineal opening.

During the next three months I dilated the stricture, and finally discharged him cured; No. 9 passing easily; every wound healed, and a good stream by urethra only.

1858.—He calls at the out-patient room at University College Hospital about once a month to have a catheter passed.

The gentleman who now acts as my assistant there, Mr. Lyon, passes No. 7 with ease on each occasion. The patient has no symptoms of obstruction whatever. Numerous scars on various parts of the belly, now soundly healed, witness the great extent to which the extravasation reached.

Remarks.—Of the numerous cases of neglected extravasation which I have seen, and which have come under my care, particularly at the Marylebone Infirmary, I never saw any one so extensive as the foregoing. Decided treatment by deep incisions until the noxious urine has a perfectly free exit from its lodgment in the cellular connections of parts; care against hæmorrhage following them, brandy, concentrated nourishment, and opium; and, lastly, cleanliness in nursing, may be regarded as the main elements of successful treatment. This man owes much to the constant and watchful care of my friend, Mr. Filliter, the resident surgeon.

Case XX.

Stricture of long standing—Retention of urine, in great measure caused by perineal abscess, and relieved by evacuation of the matter.

T. S., æt. 46, has been the subject of confirmed stricture for many years; occasionally has complete retention; has been recently exposed to cold, and has passed scarcely any water for twenty-four hours.

On examination found heat and fulness of perineum, but no sign of extravasation. After several attempts to pass a catheter, succeeded in getting No. 1 into the stricture, where it was firmly held, but could not make its progress by any warrantable amount of pressure. Accordingly I tied it in, and made a free opening into the perineum, evacuating nearly half an ounce of pus. Ordered hot fomentation and a poultice, not doubting but that I should easily pass the instrument afterwards. Returning to see the patient after about an hour, the catheter was easily introduced, and forty-five ounces of urine were withdrawn. The stricture subsequently yielded very readily to continuous dilatation.

Remarks.—This case illustrates the principle that when perineal abscess is found coexisting with retention of urine, it is rarely necessary to employ any other measures than the evacuation of the matter and catheterism, which latter is thus greatly facilitated; while extravasation, or the formation of fistula, are prevented by early attention to the abscess.

Case XXI.

Organic stricture from injury—Retention with overflow of surplus urine mistaken for incontinence—Death and autopsy.

H. H.—A cab-driver, æt. 37; well proportioned and of moderate stature; condition evidently reduced. He had been dead about twenty-four hours when the author first saw him, and took notes of his post-mortem examination, ordered by the coroner, the cause of death being unknown.

From particulars furnished by his widow, the following history was subsequently obtained.

Eight or nine years ago, at which time he was employed as "helper" at an omnibus stable, a pair of horses passing down a passage in which he was standing, forced him violently against the wall, the blow immediately causing great pain in the lower part of the belly. He remained at home ill, and unable to work, for the three months following, but had no medical attendance during any part of that period. She cannot state if any blood passed by the urethra at the time of the accident, but she knows that it has done so occasionally since. Shortly after the accident, he felt much difficulty in passing water, and has suffered retention frequently since, especially when exposed to wet and cold, as often happens, from the nature of his occupation, having driven a cab for the last four or five years.

During the last twelve months he has been much out of health, complaining of pain in his head and giddiness, pains in his loins, &c. Latterly, he has been unable to retain his urine, and has been obliged to wear some contrivance to remedy the evil.

Up to five weeks ago he had received no professional attendance of any kind, when he obtained admission to a medical ward in the Marylebone Infirmary. After three weeks' residence there, he was discharged much better. He was, however, unable to do any work, but hoped to resume it in the warm weather.

About ten days after this he felt very ill, and soon after 5 A.M., March 31, was "taken in a strong fit," was "convulsed and delirious," and "never spoke afterwards;" but after more or less general convulsion, died at noon on the following day, apparently suffering much during all that time from dyspnœa. He was seen by the assistant of a neighbouring surgeon, but the treatment, which was mainly directed to the brain, appeared to be of no service, and retention of urine was not suspected to exist by the attendant, as it passed as usual all this time, and more freely, it is stated, during the convulsions.

Autopsy, twenty-four hours after death, April 2, 1852.—*Brain:*—Consistence firm. No marks of inflammation. About one drachm of fluid in the ventricles. *Thorax:*—The substance of each lung was gorged with a pale serous fluid, which flowed abundantly upon incisions being made into it. Mucous membrane of bronchi and trachea somewhat œdematous also. Heart, hypertrophied, chiefly on left side, slight deposit on mitral valves. *Abdomen:*—Chylopoietic viscera healthy. *Kidneys:*—Each, but especially the right, presented the appearance of a greatly-distended sac, more than double the size of the healthy organ. The pelves were enormously dilated, and on being carefully punctured, were found to contain (by measure) sixteen ounces of urine. On making section, but a very small proportion of secreting substance remains, in the form of a thin layer surrounding the dilated calices. Four small cysts are seen on the surface of the left kidney. *The ureter* on each side was distended, filled with urine, and equalled in size a man's forefinger. *The bladder* formed a large and tense sac of fluid projecting above the level of the pubic symphysis. On removing it and the penis carefully from the body, it was laid open with the urethra from the upper surface. About thirty ounces of urine were contained in it. The coats were much fasciculated; in places exceedingly thick, in others not exceeding the ordinary thickness.

About half an inch anterior to the bulb of the urethra, a narrow stricture was found about three-tenths of an inch in length, and only capable of admitting a fine bristle. Dense fibrous tissue composed of bands intersecting each other in various directions, was seen beneath the mucous membrane at this spot, upon the surface of which no deposit existed. The whole of the membranous portion of the urethra was more vascular and dilated than in health, and an abrasion of the membrane existed about the size of a fourpenny piece, with an irregular effusion of lymph upon its surface just behind the stricture. The prostatic part of the canal was a little enlarged, and some of the openings of its proper ducts were somewhat sacculated. No other morbid appearances could be noted.

REMARKS.—A case of retention with engorged bladder and overflow of urine. The proximate cause of death was undoubtedly accumulation of urea in the blood, due to incompetency in the kidneys to perform the depurative function, partly because their structure had become atrophied from the fluid pressure which had long been exerted upon it, and partly from the embarrassment caused by unusual obstruction temporarily present. This is an instructive and interesting case, since it demonstrates the fact, that a stricture, even while occasioning fatal retention, may be altogether overlooked when it is attended with overflow of the surplus urine. The secretion passed involuntarily, a condition which might be mistaken, (as it really was in this instance,) for the result of some disease of the brain; convulsion, delirium, and coma, being the symptoms which chiefly attracted attention during life; while the supposed "incontinence" proved, in fact, to be the surplus of a distended bladder, distilling through a very narrow stricture. The true cause was only revealed at the post-mortem examination, the result of a coroner's inquest held to discover it. It need scarcely be added, that the condition of the urine alone, apart from the history, should have led to examination of the urethra, and to the discovery of the stricture during life. The right kidney, the bladder and urethra, form two preparations, now in the possession of the Royal College of Surgeons, being part of those sent in by the author with this Essay.

CASE XXII.

Slight organic stricture—Voluntary retention of urine maintained under certain circumstances becoming involuntary and persistent — Difficult catheterism—Obstinate stricture since.

W. D., æt. 49.—Applied to me March, 1851. A waiter at inns by occupation.

When young had gonorrhœa four or five times. Last attack was twenty years ago, for which he was under treatment twelve months, and never quite got rid of the discharge.

About nine years ago, his attention never having been called to any unusual symptoms connected with the urinary organs, he was seized with retention of urine. He was then, although residing in London, occupied as waiter (on Sundays only) at an hotel at Greenwich, which was much frequented on that day. Being employed in a room full of company, which it was his business not to leave, he resisted an urgent call to pass water, until it seemed, as he says, "that his water had gone from him," for he experienced no more desire to pass it until eight o'clock in the evening, when, endeavouring to do so, he found himself totally unable to pass a drop at first; at length, with great effort, he forced out a few drops. Being very anxious to reach his home, he left immediately, and sent for a surgeon, who, with much difficulty and after many attempts, passed a small instrument, and emptied the bladder. A good deal of blood followed, and the urine scalded him severely as it passed, for some time afterwards. He has had much difficulty and pain in micturition ever since.

REMARKS.—The subsequent history of this case presents the usual course of organic stricture, which at the time of his application to me was a very narrow and obstinate one, but it gave way to a long course of dilatation, concerning which there was nothing special to note, and the report is, therefore, not continued. But the foregoing particulars are recorded for the sake of illustrating the influence which voluntary retention of urine carried to an undue extent may have, as an exciting cause, in giving rise to an involuntary persistence of the same condition, independently of the existence of stricture, which may have been, but very slightly, if at all, connected with the attack in question. It probably arose chiefly from over-distension of the bladder, perhaps associated with contraction of the compressor urethræ muscles. Had this cause been recognised, and a *full-sized* instrument employed to relieve it, instead of a small one, the patient might perhaps have escaped the circumstances to which he attributes the urgent stricture symptoms which appeared soon after, and have persisted since.

CASE XXIII.

Gonorrhœa—Intemperance—Organic stricture neglected—Extravasation of urine not recognised at first—Death and autopsy.

G. H., æt. 53.—Admitted to University College Hospital, Dec. 31, 1841. A grave-digger by occupation.

About 14 *years ago* had gonorrhœa, which lasted some time.

About 7 *years ago*, first noticed stream of urine to be smaller, and straining required to pass it. His occupation exposing him much to wet and cold was in his opinion the cause of this. He is obliged to work with his feet in water, or in very wet soil.

Within the last two or three years he has suffered from attacks of retention, usually occurring after excess in drink.

During the fortnight before last Christmas Day, he has been more than ordinarily exposed to wet, not a day passing, he states, in which he has not been drenched to the skin.

On the 24*th of December*, his urine would not pass except by great straining, and then only by drops; and during the two following days he was unable to relieve himself at all, and suffered intolerable pain. During a fit of straining *on the* 26*th*, he felt something give way in the perineum, and a swelling soon appeared there; this became very painful, and for the first time, he applied to a surgeon, who, after long-continued efforts, succeeded in getting a catheter into the bladder, and drew off four pints of urine. The catheterism was repeated next day, when some blood followed.

On the following day (28*th*), the surgeon could not pass an instrument, but covered the perineum and adjacent parts with leeches, which afforded some relief, and he made water in a small stream afterwards.

On the 29*th and* 30*th*, the swelling increased greatly in all directions, and the pain was much more severe. He had not been able to sleep in the least degree since the 24th, on account of the agony which he experienced both in the belly and in the superficial parts.

State on admission, Dec. 31, *noon.*—Face ghastly, anxious, covered with clammy sweat. Eyes, dull and glazed. Aspect, strongly expressive of suffering, especially on the slightest motion. Tongue, dry and brown, protruded with difficulty. Pulse 120, weak, intermitting occasionally. Voice feeble; intellect quite clear. Complains of burning and smarting pain in the perineum, genital organs, groin, abdomen, and about the lower ribs.

The penis and scrotum are enormously distended, tense, and almost of a brown hue. The abdominal walls, as far as the umbilicus, have the same appearance, but less strongly marked, the colour shading off with a dull red tint into the surrounding integument. On the dorsal aspect of the penis is a black sloughy portion, the size of a half-crown piece. An indistinct sense of fluctuation is appreciable, especially in the most distended parts.

A catheter was carefully passed as far as it could be carried without force, which appeared to be a distance of about five inches, and an incision was made in the perineum, behind the point of obstruction; when, with some difficulty, owing to the condition of the parts, the urethra was opened, and the bladder relieved of its contents through the opening. Much dark-coloured, and very offensive fluid issued also from the divided tissues themselves. Other incisions were made through the skin and cellular tissue above the pubes, and in the penis, and similar fluid escaped freely from them. The patient was at first somewhat depressed and faint; and an attack of rigors followed, but in the course of the evening he felt greatly relieved, and the redness and tension were much diminished. He was allowed a tolerably free use of stimulants, as gin and brandy, with a little opium at intervals. To have a grain of morphia at night; diet of good beef-tea and milk.

January 1, 1842.—Slept some time in the night, and is free from pain except in the situation of the wounds made yesterday. Urine flows freely through the perineal opening. Tongue moister. Pulse very feeble, 130. Countenance less anxious. The sloughy patch on the penis is larger, and the margins of the incisions are very black, ragged, and gangrenous. Has taken several ounces of brandy, and a considerable quantity of nourishment. Repeat the morphia at night.

January 2nd.—Suffers more pain than yesterday. Is exceedingly feeble; pulse 140, intermitting, very weak. Nevertheless, takes food and stimulant freely. He gradually continued to sink, until the 5th instant, at noon, when he expired.

Autopsy, twenty-four hours after death.—Extensive brown, black, and green discoloration of skin, extending over all the parts described during life, and over the lower ribs on the *left* side; also backwards nearly to the spine, and up to the left scapula. On the *right* side, this condition extended no higher than the level of the navel. On removing the skin, the fat and cellular tissue beneath were found to be completely disorganized, forming large sloughy masses like wet tow, soaked in much dirty fluid, and having a most offensive odour. Such was the state of all the tissue, existing beneath the level of the anterior spines of the ilium; above this it gradually passed into firmer structures, and bands of healthy tissue appeared intersecting them, all, however, being discoloured, and apparently beginning to be decomposed. Some purulent matter appeared to be interspersed.

The muscles beneath were of an olive green colour, and softened in texture, partially disorganized. On arriving at the cavity of the abdomen, there was considerable discoloration of the sub-peritoneal cellular tissue, about the pelvis and hypogastric region, with some effused lymph and adhesions between it and the adjacent folds of the small intestine.

The whole genito-urinary apparatus being removed entire, the kidneys were found rather larger than natural. The *right* exhibits many small white points beneath the capsule, and a cyst or two. On making section, it appears congested, and sanious fluid issues from the pelvis. The *left* is not much altered from health.

Ureters, both dilated and containing fluid similar to that described.

The bladder was empty and contracted, its muscular substance greatly hypertrophied and fasciculated. The coats measured three-quarters of an inch in thickness at some parts.

The urethra exhibited a close and short stricture at the junction of the membranous with the spongy portion; in front of this was an opening large in size, with ragged and sloughy edges, through which a catheter easily passed, and entered the urethra again in the membranous portion. This was doubtless the aperture by which the extravasation took place, and had the appearance of having been formed, at all events partially, by an instrument. The parts around were so decomposed and broken up, that no very minute or accurate examination could be made, but the wound in the perineum was distinguishable, opening into that within the urethra behind the stricture.

REMARKS.—The foregoing case well illustrates the origin, progress, and pathological condition of a case of stricture leading to extravasation of urine and its consequences. The patient's case was hopeless, or almost so, from the date of admission. It was evident that the extravasation had taken place at least two days before. Had it been efficiently and promptly relieved at first by such measures as those afterwards employed, his life might doubtless have been saved, the renal disease being by no means considerable. But the extent of the gangrene was then too great to render recovery probable. The black mark seen at his admission upon the dorsum of the penis indicated this. Sir B. Brodie says that this "is an almost fatal symptom, indicating that the whole of the corpus spongiosum is infiltrated with urine."—*Op. cit.* p. 14. Yet it is not invariably so; see Case 19, p. 343.

CASE XXIV.

Organic stricture—Retention—Rupture of the bladder—Death.

J. D., æt. 70.—Admitted to University College Hospital May 17, 1841, with retention of urine, said to have existed three days, although several attempts to relieve him had been made. Has had stricture for some years.

Present state.—Bladder is greatly distended, reaching nearly to the umbilicus, with pain on pressure restricted, or nearly so, to the hypogastrium. The house-surgeon passed a No. 5 catheter, and found a stricture three or four inches from the orifice: from eight to nine ounces of turbid urine followed. The pain and tenderness continued without any relief, and in the afternoon it increased. There was then more fulness in the hypogastric region, with tension and acute pain on pressure extending to the general surface and sides of the abdomen. Eighteen leeches were ordered to the hypogastrium, to be followed by hot fomentations, and as the bowels had been confined, ten grains of calomel, followed by half an ounce of castor oil, were administered. In the evening, no relief having been afforded, venesection, fresh leeches, and calomel and opium were resorted to. Next day he continued to grow worse, very little urine having been passed; a catheter was introduced, but none could be drawn off. The symptoms of depression increased in severity, and he sank after the lapse of twenty-four hours.

Post-mortem examination, twenty-four hours after death.—*Abdomen.* The parietal portion of peritoneum anteriorly is in a state of intense inflammation, being nearly of a black hue: this appearance extended above the umbilicus. Considerable effusion of dark and turbid serum was found in the cavity, having no ammoniacal smell. On displaying the bladder, which was contracted, its serous covering was found intensely injected, and adherent posteriorly to the rectum. On removing the serous tunic, the cellular tissue around and beneath was found to be infiltrated with bloody serum, having a strongly-urinous odour; the cellular membrane broke down readily under the fingers. The infiltration has extended throughout the pelvis, reaching nearly to the kidneys. On removing the urinary organs entire, a pouch was found at the back of the bladder. On laying it open, about two ounces of thick urine and a small calculus about the size of a pepper-corn escaped. The mucous membrane was pale but much sacculated, forming several small cysts between the fasciculated muscular coat. Posteriorly, there was a round sloughy patch of the size of a shilling, communicating by a small aperture with the external cellular membrane, which was also in a sloughy state. The neck of the bladder exhibited a "fringe of warty caruncles" over the uvula. There was slight enlargement of the "middle lobe" of the prostate. On laying open the urethra at the stricture, "a warty thickening of the mucous membrane" was found, about an inch in extent. The kidneys were pale and flabby, with a slight appearance of granular degeneration.

Case XXV.

Gonorrhœa—Organic stricture—Retention and rupture of the bladder—Death and post-mortem examination.

Reported in "Lancet," October 4, 1828, by Dr. A. Garry, of Dublin.

B. M., æt. 32.—*Five years ago* had gonorrhœa, and was quickly cured, but shortly after the stream of urine became smaller than usual.

For three years it continued gradually getting worse, still without much pain, the chief symptom being the necessity for making great exertion to empty the bladder.

During the past year he has however suffered much, although absolute retention has not occurred until now.

I saw him first, *July* 25, 1828, being sent for on account of his inability to pass water. I found him in great agony. Abdomen distended and exquisitely tender; violent vomiting at intervals. Pulse quick and tremulous. Breathing much hurried. Countenance exceedingly anxious. These symptoms I learned had come on suddenly; for the evening before he went to stool, apparently as usual, when, while straining, he felt something "jump up suddenly in his belly," from which time he has been unable to evacuate either his bladder or his bowels. His belly soon swelled, and he became sick. Ineffectual efforts had been made, by an apothecary who was sent for, to pass an instrument. I first attempted to introduce a moderate-sized catheter, but could not carry it further than about two inches and a half from the orifice, where a stricture existed. I then ordered bleeding, colocynth, calomel, and opium, a turpentine enema, salines, and a warm bath, and returned home for a smaller instrument.

On again visiting the patient, I learned that his bowels had acted freely, but no urine had passed. I then attempted to pass a very small catheter, and after some difficulty carried it into the bladder, but no urine followed. In the course of the evening the symptoms were much aggravated, and he expired during the night.

Post-mortem examination on the following day.

On opening the abdominal cavity, about three quarts of urine issued. Peritoneum thickened by flakes of coagulable lymph upon it. Intestines distended by flatus. The bladder was felt forming a small hard mass in the pelvis. Removing it with the prostate, the walls were seen to be about half an inch thick in places, the muscular development being unusually marked, so that it resembles rather the left ventricle of the heart. But at the posterior part, the wall was thinner at one spot, about an inch square, and in the centre of this was a hole, with three flaps evidently produced by rupture. There was no mark of ulceration, but the margins of the aperture were preternaturally soft. The cavity was much contracted, and appeared capable of holding not more than four or five ounces of fluid. The mucous membrane was smooth and glossy, scarcely thickened. There were several strictures in the course of the urethra.

CHAPTER XI.

URINARY ABSCESS AND URINARY FISTULÆ.

Abscess—May be acute or chronic—Symptoms of acute—Treatment—Importance of promptitude—Chronic abscess—Urinary Fistulæ—Three classes of—Treatment of the first class—Treatment of the second class; caustics, &c.—Blind fistulæ—Urethro- and vesico-rectal fistulæ—Third class, or unnatural openings—Ante-scrotal—Treatment by local applications—Dieffenbach's "lace sutures"—Urethroplasty—Cooper and Earle, methods by—Displacement of skin by Dieffenbach and Nélaton—Illustrative cases—Withdrawal of urine by perineum—Ségalas and Ricord—Jobert's practice—Marshall's galvanic cautery—Perineal openings—Openings near the glans—Conclusions.

The various consequences and complications of stricture of the urethra are to be managed on those general principles which guide us in the treatment of similar phenomena in other parts of the body, bearing in mind certain special indications which the peculiar nature and functions of the organs implicated give rise to. A consideration of these will now engage our attention.

Urinary Abscess, most frequently situated in the perineum, sometimes in proximity with the anterior part of the canal, is a very frequent concomitant of organic stricture. Its pathology has already been considered. We may meet with it in two conditions; as inflammatory or acute, and as cold or chronic.

Either of these are circumstances of serious import:—the former especially often calls for prompt and decisive interference on the part of the surgeon. Generally speaking, its presence is indicated by constitutional symptoms long before local evidence appears of a marked character. Not that we ought to wait for the latter. On the contrary, supposing a patient, the subject of stricture, to be attacked with deep-seated pains about the neck of the bladder and perineum, his stream of water notably and rapidly decreasing in size at the same time, with a sense of weight, heat, and throbbing about the parts; these, accompanied by shivering, nausea, furred tongue, flushed face, sharp quick pulse, and other symptoms of fever, while all the local signs discovered by an examination of the perineum, are some heat and perhaps tension there; we are to conclude that matter is forming, pent up probably by a fascial envelope. Here the degree and situation of tenderness on pressure will help to point out the site of the affection. If a comparatively superficial swelling is presented, inclining to either side, and somewhat forward, it may be situated in the fascial connections of the corpora cavernosa. But if there be rather a general heat and fulness of the whole perineum, it is more probably confined beneath the deep fascia, the most usual place for such collections. Under these circumstances, there must be no temporizing, or waiting for it to come forward or point, but a bistoury is to be at once directed steadily in the middle line of the perineum, just in front of the anus, to a depth which will vary from an inch to an inch and a half, according to the condition of the parts, as no benefit can be anticipated from the incision unless the deep fascia be penetrated.

An incision made with ordinary care, strictly in the direction named, will do no harm, although nothing else result but a little bleeding, and the relief of tension. The issue of matter in any quantity, however small, is of course a most satisfactory result, and its free exit must be secured by providing an external opening in a depending position, and sufficiently long to ensure this. Otherwise it may burrow widely or irregularly, instead of being evacuated. No considerable hæmorrhage is to be expected if due regard have been paid to the situation of the main arterial trunks; although sometimes, especially when there has been much inflammation and induration in the part, a smartish trickling may continue for some little time. When it has ceased, a poultice should be applied to the wound. A surprising improvement in the patient's condition often takes place almost immediately; the fever subsides, and complete recovery may follow in a very short time.

The importance of speedily evacuating such collections of matter, even at the very commencement of their formation, cannot be overrated. It is often no easy matter to decide upon their existence, and we are not warranted in requiring *absolute* evidence of the fact before making the incisions described. Matter pent up behind the deep perineal fascia which forms a partition too dense to be penetrated by the action of absorption, will find its way into the cellular tissue of the pelvis, by the side of the bladder, between it and the rectum, and give rise to most dangerous, if not fatal consequences, or in event of recovery, to urethro-rectal or vesico-rectal fistulæ. Otherwise it may burst into the urethra and be discharged by the external meatus. The collection having been opened, pus in some quantity escapes, usually alone, sometimes mixed with urine, but not necessarily so. More generally the urethral membrane, which has presented but a thin barrier between it and the stream of urine, gives way in a day or two, and the urine appears then for the first time. But one of the main objects to be attained by making an early opening into a collection of matter in the perineum, is to prevent the occurrence of any lesion of the urethral walls. If the evacuation of matter is soon and fully ensured, we may hope to find the cavity gradually closing, and that no urine will penetrate it. This having been accomplished, we have less fear of its remaining open for a long period, or of its becoming an abnormal passage for the exit of the urine. If, on the other hand, the incision has been delayed, and when also, as often happens, the abscess runs a chronic course, a urethral communication is almost certain to be established sooner or later. In the latter case it is equally desirable that the matter should be evacuated as soon as its presence is observed. An unnatural opening, however, having been established, the frequent passage of the urine through it prevents its closure, and this will inevitably occur at each act of micturition if the stricture be narrow. This artificial canal, usually termed urinary fistula, is one of the commonest accompaniments of neglected stricture, and forms often one of its most troublesome complications.

URINARY FISTULÆ.—The external openings of these passages are most commonly to be seen at the surface of the perineum and scrotum, which parts are traversed by them in various, and often by circuitous routes; less frequently they are observed in the groins, the upper part of the thighs, the adjacent part of the nates, or even above the pubic symphysis. In the last-named situation, the devious channel usually results from incisions originally made to relieve extensive extravasation of urine, and which have never healed; but in the scrotum or perineum the existence of an abnormal outlet is generally due to a previously-existing urinary abscess.

Under the familiar term of urinary fistulæ all these conditions are commonly included; some of them simple, and easily amenable to treatment; others complicated, and requiring much time, care, and perseverance, in order to attain a successful result. Some are merely narrow channels through nearly healthy parts; others pass through structures greatly indurated, augmented in size and density by repeated deposits of plastic matter, and more or less deformed; and sometimes connected with cavities secreting pus and detaining in their interior some quantity of the urinary secretion. The external orifices of the fistulous passage may be few or numerous; in the latter case being the outlets of sinuous and branching channels springing in process of time from the original track, and giving exit to a number of small streams when the act of micturition is performed; and lastly, besides the foregoing, there is a class of unnatural passages or openings into the urethra, which have their origin in loss of substance by sloughing from extravasation, or phagedænic ulceration, or as the consequence of violent injury to the parts; and these abnormal conditions are quite distinct in character, results, and in relation to the treatment required, from the two preceding classes.

The mode of arranging and separating the numerous and widely-differing lesions comprehended under the general term urinary fistulæ, which is thus indicated, is simple, accurate, and desirable to be recognised in dealing with the subject. It comprehends three very distinct typical forms of morbid condition, each requiring a method of treatment equally distinct in order to be appropriate.

1. Simple Fistulæ.—The first class embraces those cases where, in connection with stricture of the urethra, one or more fistulous passages exist, by which the urine traverses the perineum or scrotum, the surrounding parts being not much altered from their natural or healthy condition. In this category may be classed the great bulk of the cases ordinarily met with. These openings must be regarded as the result of Nature's mode of affording relief in cases of narrow stricture,—in other words, as safety-valves to the dangerous pressure which is being exerted upon important organs behind the obstructed point; as—while they nevertheless form fresh complications of the original complaint—most effective guarantees against those more dangerous consequences which would otherwise threaten, in the form of actual retention, or as chronic inflammation, hypertrophy or perhaps dilatation of the bladder, of the ureter, or even, at last, organic changes of the kidneys themselves. Thus we may often see patients with large fistulous passages in the perineum

giving exit to all their urine, enjoying extremely good health for years together. But the excessive annoyance, sometimes the pain, besides the tendency to grow worse which, even in these exceptionally favourable cases, are necessarily present in connection with urinary fistula, to say nothing of considerations arising in relation to the sexual function, demand the interference of the surgeon to bring about a natural state of things.

TREATMENT.—With regard to the large class which we are considering, as a rule, nothing else is required than to dilate fully the urethra. The urine will flow by the natural channel, and the fistulæ will heal of themselves, if we ensure a free passage from the bladder. There need be no meddling with the fistulæ; the less they are touched the better. Their disappearance is almost certain if we can maintain the urethra in such a condition that a No. 8, 9, or 10 catheter can pass easily into the bladder. This is a proposition which may be regarded as fully established. (See Case No 6.) Those patients who form the exceptional instances to this rule are for the most part weak in constitution, have little reparative power, or are subjects of some chronic disease in addition to stricture of the urethra. The management of such may be conveniently considered with the next class, viz.:—

2. FISTULÆ WITH INDURATION.—Those cases in which the fistulæ pass through tissues which are more or less indurated and deformed by repeated deposits of inflammatory exudation; such being often connected in some part of their course with cavities, the sacs of former abscesses secreting thin or sanious pus.

TREATMENT.—It may be almost unnecessary to observe that in such instances, also, the primary object must be to dilate adequately the stricture, and to observe the effect induced. In most even of these cases this is sufficient to enable the surrounding parts slowly to improve, and, finally, the fistulous passages to take on the healing process. The dilatation, however, having been made and maintained for some time, and little or no benefit having resulted in the condition of the fistulæ, there are two courses open, one or other of which it will be desirable to adopt: the first is to stimulate in some measure the walls of the fistulæ themselves, and so bring about adhesion of opposing surfaces; the second, to lay them open, in order to produce recent and healthy wounds, so that they may heal up soundly from the bottom. But associated with such treatment, it is of the highest importance at the same time to attend closely to the patient's general health, seeking to maintain the secretions and excretions in a natural condition.

Various agents have been employed for the accomplishment of the local measures first named. One of the most useful is the concentrated tincture of cantharides, applied on a camel's-hair brush, or on a probe armed with lint, or a fine syringe. Solutions of the sulphate of zinc or copper, and of the nitrate of silver, have been introduced by means of a syringe, sometimes with apparently good result. One of the best modes we can employ is to introduce carefully, as far as it is possible, a small and flexible silver probe, coated with nitrate of silver. This may be easily done in the following manner. A small quantity of nitrate of silver is to be melted in a test tube or watch-glass, over a lamp, and about a half or three-quarters of an inch of the extremity of the probe immersed in the boiling fluid; while there it is to be turned round on its axis, and the lamp removed, when, as the temperature decreases, a thin and equable coating of the caustic will take place upon the instrument. The probe, thus armed, must be carried quickly up the fistulous sinus, a plain probe having been introduced immediately beforehand as a guide to the length and direction of the passage. It often happens that the external orifice of the sinus is smaller than any other part of it. It is advisable, in such a case, to apply a little caustic potash, for the purpose of enlarging it, and so facilitating the removal of the discharge, which is essential to success. (Case No. 26, page 377, is an excellent illustration of this treatment.)

The application of compression to the fistulæ has been tried several times, and success has been claimed for it in two or three cases. M. Diday of Lyons not long ago communicated a case at some length to the Société de Chirurgie of Paris, in which he states that he obtained a successful result, all ordinary means having failed, by making the patient apply firmly to the perineum an india-rubber ball, inflated with air, on every occasion before making water, and for some minutes afterwards. This plan was studiously followed during fifteen days, when the opening had soundly cicatrized. Four months after the patient was perfectly well.[*]

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[*] "Bull. de la Soc," vol. v. 1855. P. 45.

Heister recommended compression for these cases also, by means of the truss or "yoke" invented by Nuck for incontinence of urine. "Institutiones Chir." Amst., 1739. Cap. 145. Nuck's instrument is engraved in his "Observationes," Fig. 11, p. 139. Lugd., 1696.

The cure of obstinate urinary fistula has often been attempted by introducing a catheter, and permitting it to remain in the urethra for days together, on the principle of ensuring, as it has been supposed, the passage of the urine through the instrument, and thus preserving from irritation the fistulous passages.

Little, however, is gained by these efforts, for experience shows, that however large the instrument may be, and however closely it may fit the urethra at the present moment, before twenty-four or thirty-six hours have elapsed it will lie loosely in the canal, and urine will pass by its side. It is not possible, in fact, to remove urine from the bladder, and at the same time to avoid contact with the urethra, for any lengthened period by this means. But further, if the attempt to maintain the urethra constantly distended, by substituting an instrument of larger size as soon as the inlying catheter is inadequate to fill it, be persevered in, a likely result will be ulceration of some part of the urethral walls, a condition which will not aid much to produce any healing of the fistulæ associated with it. I have seen such an accident produced solely in this way, its occurrence becoming too obvious in the formation of a fresh fistula anterior to the scrotum, where the urethra coverings are thin, purely from an unsuccessful attempt to maintain the bladder empty, and prevent the urine from coming into contact with the urethra by this means. The passage of urine by the side of an instrument is due, as I have had frequent opportunities of observing, when maintaining catheters in the bladder for the treatment of narrow stricture, to an action which it is impossible to prevent in these circumstances—viz. that of capillary attraction. As soon as there is the slightest interval of space between the catheter and the walls of the urethra, urine begins to drain off, in obedience to the law referred to. This action remains in continuous exercise, and is to be distinguished altogether from that by which urine flows freely, in obedience to an expulsive effort of the bladder. In this case, it is true, the fluid takes commonly the course of the catheter; but the continuous drain which occurs by the side of the instrument from the cause named, inevitably defeats our efforts to preserve the urethra free from the presence of urine. The mode of treatment, therefore, which consists in tying in a catheter, is to be regarded as inadequate to the cure of fistula, except so far as it produces dilatation; and it is one which has obtained countenance chiefly from the plausibility of a theory which is certainly unsupported in practice. It will generally be better to withdraw artificially all the patient's urine, by introducing a catheter three or four times a day, if it be really necessary, than to permit the instrument to remain in the bladder, and prove a source of constant irritation.

Free incisions through the fistulæ, down to their origin in the urethra, or nearly so, have been sometimes found successful in inducing a new and healthy process of granulation from the bottom of the wound, and thus in ultimately producing complete closure of the unnatural passages,—provided always, however, that there is no obstruction to the free egress of the urine by the urethra, otherwise no such measure can be of any service. In some cases in which external division of the stricture on a grooved staff is indicated, this operation may be performed in such a manner as to include the fistulous opening in the incision, in which case a successful result may generally be reckoned on. Whether or no, a simple incision carried through the fistulous track may sometimes aid in ensuring the free discharge of matters hitherto more or less confined within irregular cavities, which, so long as they exist, present an insuperable obstacle to reparative action in the tissues.

For more than a century and a half it has been occasionally the practice amongst surgeons, especially in France, to make an artificial opening in the perineum upon a grooved staff, in order to give issue to the urine, for various purposes in connection with diseased bladder and urethra. In this manner the irritating fluid being withdrawn by a short route, the parts anterior to it were relieved from its injurious influence, and were observed to acquire a healthier condition. (See p. 258.) Much more recently the puncture of the bladder by the rectum, has been practised with a similar result, more especially where an unusually narrow or irritable stricture has existed with numerous fistulæ. (P. 209.) The principle upon which these methods of proceeding have been serviceable, is that of removing all sources of irritation, but particularly the constant passing of acrid urine from both the natural and unnatural channels which had hitherto given exit to it. The precise mode in which it should be made applicable must be determined according to the individual requirements of each particular case. The instances, however, in which such measures are necessary, must be looked upon as of rare occurrence.

The subject of providing for the withdrawal of the urine from the bladder without contact with the urethra will be again considered in connection with the next class of cases, in which the achievement of that desideratum is an almost necessary element to the success of those operative measures which are usually understood to be comprehended under the term Urethroplasty.

An obstinate species of fistulous opening, communicating with the prostatic part of the urethra, is that which in a few exceptional cases follows the operation of lithotomy. The introduction of an iron wire heated, to intensity, has appeared to me, in a few cases which I have seen, to afford the best means of obliterating it.

A fistulous passage is sometimes prevented from closing by the presence of a small calculus in some part of its course. This may occur either by the lodgement of some small concretion which has escaped from the bladder, or from the deposit and production of such a formation from unhealthy urine while passing through the sinus. Most commonly, I believe, the condition is present in fistula which is connected with diseased prostate, or in connection with calculous formations there. These have been discharged by nature through such passages, or have been removed artificially by enlarging them, and extracting the foreign bodies which sometimes exist in considerable number in this situation. Fistula associated with the prostate may, however, exist in the absence of any of these causes; such as those which are sometimes connected with prostatic abscess, and which are generally exceedingly obstinate and irremediable.

Fistula is not necessarily a complete or continuous passage from the urethra to some other surface; it may have an opening at one end only, and have a blind or cæcal extremity for the other.

Hence "blind urinary fistula" has been described. A small tumor, originally formed by a collection of matter, with thickened walls, and having a communication with the urethra, constitutes the general form. Its origin has been variously accounted for. Some observers connect it with stricture. Others with inflammation of the mucous follicles of the urethra. Sir B. Brodie takes the latter view. Sir Charles Bell attributed it to inflammation and suppuration of Cowper's gland when situated close to the bulb. A firm small swelling is felt externally, and its contents are sometimes to be evacuated into the urethra by pressure. Ordinarily, there is more or less constant oozing of these from the meatus, giving rise to what is called a gleety discharge.

This will not disappear until the tumor is opened externally, when it becomes a fistula of the ordinary kind, requiring treatment already indicated.

Urethro-rectal fistulæ sometimes occur as a consequence of stricture, and more rarely, perhaps, vesico-rectal. In either case their existence is usually first announced by the appearance of some feculent matter by the external meatus, or of a stain communicated to the urine. The escape of gas also is occasionally perceived through the urethra. Sometimes the patient notices the passage of liquid in an unusual manner and quantity by the anus, and that habitually, while a diminished quantity is observed to come by the natural passage. With the latter conditions we may suspect the existence of vesico-rectal, rather than of urethro-rectal fistula.

It is not an easy matter to close these openings, unless of very small size, but the actual cautery, and particularly that heated by the galvanic current, affords the best chance of success. It may be applied through the rectum, a speculum having been first introduced, and a full-sized sound carried into the bladder. Both of these are afterwards removed. On the day before the operation the bowels are to be freely purged and cleared by an enema an hour or two before the application of the cautery, after which they must be prevented from acting for two or three days. The cautery is to be re-applied two or three times at intervals of about ten days, if necessary. Combined with this treatment, the application of a suture is sometimes advantageous. Special instruments are applied for the purpose, and these sometimes require to be slightly modified in size or form for individual cases.

3. FISTULÆ WITH LOSS OF SUBSTANCE.—This class of urinary fistulæ comprehends those cases in which unnatural openings into the urethra exist, not necessarily depending, like those belonging to the preceding classes, upon obstruction of the canal, but upon actual destruction of substance from the walls of the urethra and superjacent parts. The common causes of these are, sloughing from extravasation of urine, simple and phagedænic ulceration, and mechanical injuries of various kinds.

These openings are for the most part larger, although not invariably so, than any of those already referred to. Generally a portion of the floor of the urethra is destroyed, as well as the structures which have intervened between it and the external surface, so that in many cases more or less of the mucous membrane of the upper aspect of the canal is visible from the outer orifice. As a consequence, the whole, or nearly the whole, of the urine passes by the artificial channel in a full stream. Such abnormal apertures may be regarded, for practical purposes, as naturally arranging themselves into two distinct divisions, viz.—

(*a*) Those which exist before the scrotum, or in the penile portion of the urethra, sometimes called ante-scrotal or urethro-penal fistulæ; and

(*b*) Those which are found in or behind the scrotum, known simply as scrotal and perineal fistulæ.

A broad distinction exists between the cases of each division, in relation to their amenability to treatment, and to the nature of the operative measures which must be undertaken with a view to their cure. Ante-scrotal urethral openings are by far the most difficult to close. The coverings of the urethra here are thin, possessing substance insufficient to furnish an amount of granulations adequate to close any but the most insignificant aperture. For the same reason, it is difficult to obtain from their immediate neighbourhood a flap endowed with sufficient vitality to preserve its existence after the process of transplantation. And further, owing to the extreme mobility of the member, it is difficult to maintain that perfect steadiness of position so desirable in a part which is the subject of an autoplastic operation; while the alteration in size and form which this organ is especially liable to exhibit, through the occurrence of erections which are often quite uncontrollable, may impair, or sometimes render almost impossible, the success of the best-planned and most skilfully executed operation. Nevertheless, with all these difficulties, in addition to that formidable one, the contact of the urine before referred to, such openings, even when large, are not now by any means to be regarded as beyond the reach of surgical skill. The exercise of considerable tact, ingenuity, patience, and of unremitting attention during a long period of time, is indispensable on the part of the surgeon who undertakes to treat a case of penile fistula, requiring a plastic procedure for its cure; and some little resolution, with a good stock of patience, may be equally necessary on the part of the patient.

Openings in the perineum, involving loss of substance, on the contrary, although by no means easy to close, are remediable with less difficulty than those in the anterior part of the canal, and that on account of the absence of conditions which have been just adverted to, as constituting the more prominent obstacles in respect of the latter class.

It is within the last few years only that these distressing lesions have been rendered amenable to surgical treatment. Formerly they were regarded as amongst the opprobria of our art, and were abandoned as beyond its power. Generally speaking, some operative measure, which has for its object the transplantation of a flap of the neighbouring integuments to supply the loss of tissue at the opening, is necessary. In a few instances, however, where the openings are small—cases, by the way, which are rare—this proceeding has been dispensed with, and their complete closure has been accomplished by other means.

TREATMENT.—First, then, ante-scrotal fistulous openings which are of small size, but obviously depending upon loss of substance in some degree, have been closed by repeated applications of a caustic agent to their edges and to the surrounding parts. Sir A. Cooper records a case in his "Surgical Essays," in which he closed a fistulous opening of the size of a pea, and situated immediately in front of the scrotum, after the failure of two operations by the hare-lip and interrupted sutures, by the application of nitric acid "to the edge of the fistulous orifice and upon the skin, to the extent of three-quarters of an inch around it." The process was repeated several times within the course of six or eight months, when the orifice was perfectly closed. Sir A. Cooper observes on this fact—"But still it is only in cases in which the skin is very loose, or the scrotum is forming a part of the fistulous orifice, that this plan would succeed, as, where the skin is tight, it would be scarcely possible to draw it together so as to produce its union."*

In the same manner the nitrate of silver, or tincture of cantharides, rendered stronger than ordinary by evaporation, have been successfully employed in very small openings. Dieffenbach was in the habit of employing the latter agent in the following manner:—Having passed a full-sized bougie into the canal, he introduced a camel's-hair pencil dipped in the tincture referred to, and thoroughly applied it to the inner border of the opening. He repeated this three or four times in the course of twenty-four hours, and at the end of that time scraped out the loose cuticle raised by the blistering fluid. Action was excited on the raw surface by another application, and this process was repeated until the granulations were healthy, and bid fair to close the aperture. He tried on several occasions the introduction of a hare-lip pin, and also a single point of interrupted suture, after thus making raw or "reviving" the lining of the fistulous opening, but without success. The use of the irritant agent uncomplicated with the suture gave generally a better result. Subsequently he contrived a suture, which produced more successful results than any such method previously employed, to which he gave the name of "the lace suture;"* (Schnürnaht.)

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* "Surgical Essays." By A. Cooper, F.R.S. London, 1819. Pp. 205, 206.

He describes it as applicable to small fistulæ in the anterior part of the canal, and when the surrounding skin is supple and healthy. The margin of the unnatural opening, as well as the surrounding skin for a short distance, must be frequently touched during the day previous to the operation with the concentrated tincture of cantharides. Before proceeding to use the suture, the loose epidermis raised by the blistering fluid is to be removed by scraping, a sound introduced into the urethra, and made to pass below the opening. The operator is then directed to take "a small curved needle, sharp at the point, but not at its edges, with a stout silk waxed thread, and by means of a needle-holder to introduce it beneath the skin at about three lines from the border of the fistula." The point of the needle is to be carried deeply, but not into the urethra, and made to emerge at another point, about three lines from the margin of the fistulous opening. By three or four of these stitches, the thread is to be carried round the opening, until it finally emerges at the point at which the needle was originally entered. The thread therefore now lies deeply in the cellular tissue around the fistula, at about three or four lines distance from it. (See figs. 30 and 31.)

The two ends are then to be drawn together gently and slowly, so as to tighten the thread, and gradually approximate the borders of the fistulous orifice until it is obliterated. Lastly, the ends are to

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* Dieffenbach's description of this was originally published in Dr. Oppenheim's Journal at Hamburgh—"On new Methods of Cure in Cases of Unnatural Openings in the Anterior Portion of the Male Urethra." This was translated by Mr. Swift for the "Dublin Journal," No. xxix. vol. x., 1836. Dieffenbach has since illustrated the subject in his work, "Die Operative Chirurgie," Von Johann Friedrich Dieffenbach. Leipzig, 1845. Vol. i. p. 529.

FIG. 30.

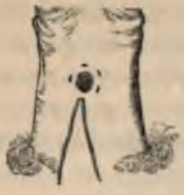

FIG. 31.

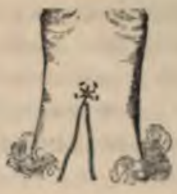

FIG. 30.—Dieffenbach's "lace suture." The thread encircles the fistulous opening; its two ends are seen issuing from the point at which the needle was first introduced.

FIG. 31.—The suture tied, and the opening closed. The knot uniting the two ends of thread sinks deeply into the cellular tissue, and is, therefore, not seen.

be fastened by a knot, which, when fastened, sinks into the cellular tissue, and disappears. A piece of wet lint is to be applied to the part, the sound withdrawn, and the patient directed to pass urine, when requiring to do so, by the natural passage. In three or four days, the ligature may be divided, and drawn away. "Even," says Dieffenbach, "if the first application does not quite close the opening, this is rendered smaller, and the succeeding operation is easy, and certain to succeed."

URETHROPLASTY.—When the opening is too large for such treatment, it is generally necessary to resort to some plastic procedure for its cure. Such operations are comparatively of recent date, the first on record, which I have been able to discover, being one designed and successfully performed by Sir A. Cooper in 1818. A man, æt. 56, had an ante-scrotal opening, half an inch in length; the margins of this were pared, and a flap was dissected from the scrotum, leaving a broad attachment. It was kept in place by four sutures and by plaister. Adhesion was ultimately perfect.* Another case followed in the practice of Mr. Earle, of Bartholomew's, in 1819. Here the opening was perineal; the first operation failed, but the second, also by flap, in the following year completely succeeded.† In these two cases the plans of proceeding were totally different: in them we have not only the germs, but, to a great extent, the development of those modes of operation since adopted in other countries.

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* "Surgical Essays." By A. Cooper. London, 1819. Part ii. p. 207.

† "Practical Observations on Surgery." By H. Earle. London, 1823. Roux and Jobert have, nevertheless, claimed for France the first employment of these two proceedings, on the ground of operations performed many years subsequently to those named in the text. They are, on this account, specially referred to there.—*Traité de Chir. Plast., par A. J. Jobert (de Lamballe)*, tom. ii. pp. 136, 149. Paris, 1849; *Quarante Années de Prat. Chir.*, Ph. *J. Roux*, tom. i. p. 56. Paris, 1854.

A much older French work accords priority to Cooper and Earle.—*Autoplastie, par Ph. Fréd. Blandin.* Paris, 1836. P. 75.

In dealing with the ante-scrotal fistulæ which were too large to be remedied by the "lace suture," that is to say, such, for example, as would permit the introduction of a full-sized catheter—Dieffenbach proceeded as follows.

A large catheter having been introduced into the bladder, the rounded orifice of the fistula is converted into a lozenge-shaped one, by the removal of a small piece of skin above and below it, as indicated in fig. 32 by dotted lines. A longitudinal incision through the skin was then made on each side, at the distance of about half an inch, or a little more. The point of a fine scalpel is next to be carefully carried, by successive strokes, beneath the skin which intervenes between the two incisions, so as to detach it from the subjacent parts, and form what Dieffenbach called "a bridge," for the purpose of permitting urine to escape from the fistulous opening at the lower extremity of either incision: the borders of the fistula are also to be revived. The condition described is indicated by the probe seen to be passed beneath the skin at fig. 33.

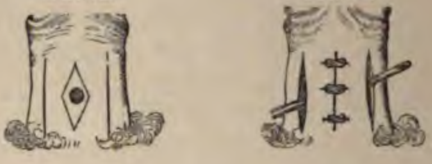
FIG. 32. FIG. 33.

FIGS. 32 & 33.—Dieffenbach's method by "lateral bridges" and twisted sutures.

FIG. 34.

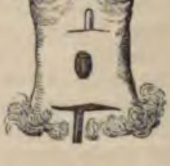

FIG. 34.—Nélaton's modification in the situation of the incisions.

Although sometimes failing, this method may be regarded as affording a fair chance of success, provided that the aperture is not too large. It is based, as will be observed, upon the principle of bringing into contact, *not mere edges of thin tissue*, the adhesion of which cannot be expected to take place, but broad surfaces freshly revived, and maintained in apposition by light compression. It may be laid down, however, as a general rule, that success is not to be expected by this operation if applied to openings that measure more than the third of an inch in any direction.[*]

A slight modification of Dieffenbach's plan has recently been practised by M. Nélaton of Paris, which consists in making the outlying incisions above and below the fistula, instead of laterally, as recommended by Dieffenbach. It is supposed that this affords a still better chance of permitting the free escape of urine.[†] The upper and lower incisions should be distant each about an inch from the fistulous opening, and the skin should be completely detached from the subjacent connections, commencing at the borders of the fistula, the dissection being carried up to the incisions as well as in a lateral direction (see fig. 34). Again, since the use of the twisted suture is sometimes attended with gangrene of the skin included in it, and the operation becomes sometimes thus defeated, it is proposed not to close the opening by any suture at all, but to permit it to contract by itself, at all events for a few days, when one or two pins at most will bring together the granulating surfaces, and enable union, in a few hours, to take place. A case by M. A. Richard is recorded in the journal named below, in which the last-mentioned plan of proceeding was successful.

I adopted this latter method in a case at the Marylebone Infirmary, in January, 1855, in the case of a man who had lost a large portion of his urethra, amounting to fully an inch and a quarter of its floor and sides, anterior to the scrotum. He had previously been under my care for extravasation of urine, producing enormous sloughing, from which he fortunately escaped with his life, but with the mutilation referred to. When he had completely recovered, I proceeded according to the method delineated at fig. 34, by detaching the skin from its subjacent connections above and below the fistula, as well as on each side. But this was too large an aperture to be successfully treated on this plan, and, with my present experience, I should certainly not adopt it. It is to be regarded as applicable only to openings which certainly do not exceed half an inch in length; nevertheless, there were some reasons in this case for selecting this operation, at all events for the initiatory attempt. First, there had been sloughing of the scrotum to a considerable extent, so that it would not be very easy to form a flap sufficiently large from that part, and in a suitable position for the purpose, at all events, without including some cicatricial tissue in it, which it would be undesirable to do. Secondly, the surrounding skin of the penis was loose, abundant, and would easily supply the required flaps or "bridges." Thirdly, supposing the operation to be unsuccessful, the scrotum would still be in no worse condition to furnish a flap, should it be determined afterwards to attempt the cure by that method. Without detailing the history of this case, I may say that it was conducted strictly according to the plan detailed above; that the gushes of urine which would sometimes, in spite of all care, issue through the large ante-scrotal opening, broke up adhesions which, during the first three days, promised well, and caused gangrene of the flaps or "bridges," leaving the man ultimately in about the same, certainly in no worse, condition than he had previously exhibited.

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[*] A method adopted by M. Alliott, of Montagny, in the year 1833, for closing an ante-scrotal fistula of moderate size, was successful, and differed in some respects from any which had been previously employed. It consists in forming a flap from the skin on one side of the fistulous opening, in drawing it over, and in adapting it, not upon the opening itself, but to a raw surface previously made to receive it upon *the other side*. Thus the fistula is covered in by the base of the flap, whilst the greater part of the uniting surfaces is not in the track of the urethra, but on the other side of it. This case is detailed at length in the "Gazette Médicale de Paris," 1834, p. 348.

[†] The first account of this method appears in the "Gazette des Hôpitaux" of August 10, 1852; but a fuller description and a case by M. Richard are given in the same journal for March 28, 1854.

Shortly after this, I was witness of a precisely similar operation, performed by my friend and colleague Mr. Erichsen, in University College Hospital. In this case, there were two fistulæ, one perineal, the other ante-scrotal. The former had been previously treated with success by a plastic operation; and the second, the orifice of which was about the size of a pea, immediately in front of the scrotum, was then submitted to the plan described, and the result, after two or three applications of caustic, to close a very small aperture remaining, was completely satisfactory.

Dieffenbach employed another method for the closure of openings similar to the last-mentioned. By this method, the skin, instead of being moved transversely from the sides of the penis, is moved upwards from the scrotum. A catheter having been introduced into the bladder, the fistulous opening is included between two elliptical lines of incision, passing in a transverse direction, one above, the other below it. The surface so marked out, and with it the borders of the opening, are then to be lightly pared (fig. 35, *a a*). Next, another transverse incision, of about two inches in length, is to be carried through the skin at the root of the penis,—that is, at about an inch beneath the lowest elliptical incision and parallel to it (indicated by a straight line at *b*). The bridge of skin thus formed is to be carefully dissected up from its cellular connections. The bridge being now movable, is drawn up so that its superior border comes into contact with the line of skin marked by the upper elliptical incision, and maintained there by five or six fine hare-lip pins and twisted sutures (fig. 36, *a a*). A raw surface is left below.

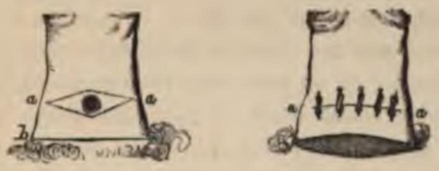
FIG. 35. FIG. 36.

FIGS. 35, commencement, and 36, completion, of Dieffenbach's operation by transverse incisions.

In cases where the deficiency was more considerable, Dieffenbach proposed, after making the "lateral bridges" before described, but more extended, and placed further apart in proportion to the size of the opening, to bring together the borders of the fistulous orifice in the skin, not with a few points of twisted suture, but with lateral leather splints. For this purpose, two strips of leather are prepared, about three lines broad, and rather longer than the opening to be closed, each perforated by three small holes, to permit a suture to be passed through. These are to be applied laterally to the two borders, previously raised and placed with their raw surfaces in contact, and the needles are to be passed through the holes in the splints and the two layers of skin together, so as to ensure perfect approximation and the contact of considerable planes of surface for adhesion. The author states that he has not yet made trial of this suggestion, but a precisely similar plan has been pursued by Mr. Le Gros Clark, in our own country, with whom the idea appears to have been perfectly original. In his case there was a very large ante-scrotal fistula, and the result was perfectly successful.*

An improved application of this principle would be the use of one or two silver plates, corresponding in form with the surface of the penis or scrotum, and bored with three or more holes near either margin, for the passage of sutures. The plate, if single, should cover the opening and the sound skin on either side, to the extent of two-fifths or the half of an inch, and through the openings should be passed sutures of silver wire. I have no doubt that some such adaptation of a method, which has been recently employed with considerable success in cases of vesico-vaginal fistulæ, would be attended with good results in the cases under consideration, and I shall take an early opportunity of testing it.

It will be readily understood that the great obstacle to success in all operations for ante-scrotal fistulæ of large size, is the passing of urine between the newly-approximated surfaces. It has been seen above that the inlying catheter does not prevent this, since urine oozes by its side. Hence its removal by other means has long been a desideratum. Accordingly, M. Ségalas adopted the method of diverting altogether the course of the urine by a perineal opening during the process of healing in the anterior wound. He did this successfully in 1839, for a patient the subject of scrotal and perineal fistulæ, dilating the latter by the bistoury, at the same time that he operated on the former; a catheter being maintained afterwards in the bladder, but through the perineal fistula.† Next year Ricord did the same thing, making a new opening in the perineum and carrying all the urine off through it; the result was perfectly successful.‡ Jobert, on the other hand, thinks the perineal opening unnecessary; and opposes it on the ground of the presumed dangerous nature of the operation. He believes that with great attention and care on the part of the surgeon and his assistants, together with much patience and determination on that of the subject of the

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[*] "Med. Chir. Trans.," 1845. P. 413.

[†] "Lettre à Dieffenbach." Paris, 1840. P. 48.

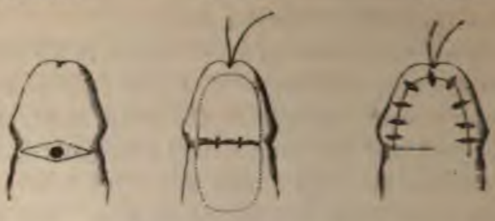
[‡] The French Academy awarded the Montyhon Prize of 1841, to MM. Ségalas and Ricord, conjointly, for these operations.

fistula, the plastic operation alone may be perfectly successful for ante-scrotal openings of the largest size.

In several cases, published at great length in his work, which M. Jobert treated by transplantation of a flap (this being maintained in its new position with sutures in the usual way), the exit of the urine was provided for by maintaining constantly in the passage a gum-elastic catheter, but the union was often totally wanting, and was never otherwise than incomplete at first. The flow of urine outwards through the wound could not be prevented, and the track by which it issued was always marked by non-union. Consequently repeated operations were frequently necessary on the same individual. At best not more than two-thirds of the flap united at the first attempt; sometimes not so much as that. A troublesome fistula still remained, and fresh paring and re-paring, stitching and cauterizing, were necessary on several occasions before a successful result was arrived at. It is impossible to read carefully the histories of these cases, as well as those of others who have pursued a similar course, without being impressed with a strong conviction that the presence of urine is the great obstacle to success; nor can the observer fail to mark how futile is the attempt to defend the wound from its deleterious action by maintaining a catheter in the canal. The urine, rising almost constantly by capillary attraction between the surfaces of the urethra and the instrument, is, by the presence of the latter, so far from being removed or carried safely away from the recently-cut surfaces, rather brought into more frequent or continuous contact with them. These parts are preserved, it is true, from the effects of a gush of urine at the act of micturition, but the condition just described, scarcely less inimical to the process of adhesion, is almost inevitably a concomitant one. At the same time, experience has proved beyond all question, that the formation of a perineal opening is an operation attended with little, if any, danger in these circumstances.

It is necessary, in order to complete this part of the subject, to mention briefly here Dieffenbach's method for closing openings into the urethra immediately behind the glans, in the situation of the frænum. Such are usually the result of chancrous ulcerations. Two elliptical incisions are to be made, one transversely above, the other below the opening, and the surface so included is to be pared (fig. 37). The upper and lower borders are then brought together

FIG. 37. FIG. 38. FIG. 39.



FIGS. 37, 38, and 39, exhibit the first, second, and third stages of the operation described in the text.

by two points of interrupted suture, one end of each being brought out, before the knot is closely tied, at the external meatus, the other end being cut off as short as possible. The necessity for so arranging the thread arises from the next step of the operation, which consists in covering the wound and adjacent parts with a flap of skin; after which, it will be seen that, in order to withdraw the sutures at the appointed time, their ends must have been previously placed in the position indicated. First, the skin of the adjacent surface of the glans is to be pared to the extent and in the form indicated by the semicircular dotted line above the closed wound, as seen in fig. 38; after which, the prepuce being well retracted, a corresponding portion of its inner surface, thus exposed, is pared also: indicated by the semicircular dotted line below the wound in the same figure. The prepuce is now to be drawn forwards, the two semicircular surfaces brought into apposition, and contact maintained by six or seven twisted sutures. This, the final stage of the operation, is represented in fig. 39.

OPENINGS IN THE PERINEUM.—As regards the treatment of these openings, depending on loss of substance, much must depend on the necessities of each individual case. Generally speaking, such openings, requiring plastic operation, are rare; the soft parts are abundant, the urethra is very deeply placed, and thus more active agents than the cautery, in some one of its various forms, are not often necessary.

For deep and narrow openings in the perineum, much may sometimes be done by the application of this agent, provided the operator commences at the bottom of the sinus, close to the urethra itself. Little by little, adhesion, contraction, and, finally, closing in of such a passage may be accomplished in this manner. Perhaps the most efficient means of applying the actual cautery, when it is needed, is the galvanic apparatus originated by my colleague, Mr. John Marshall, of University College Hospital. The advantages of thus employing a galvanic current consist in the power which the apparatus possesses to maintain in the cauterizing wire an exceedingly high temperature, nearly that of white heat, during all the time required for the process of application. By the ordinary mode of heating an instrument in a charcoal fire or gas-jet, the temperature necessarily begins to diminish rapidly before the application to the diseased part can be made, and sometimes several repetitions of the heating process may be necessary. The galvanic cauterizing instrument, on the contrary, can be applied and adjusted while cold, and, consequently, with care and deliberation, and while *in situ*, the current can be transmitted through it and the wire heated for any indefinite period of time. Another circumstance adds to the utility of the method in some cases, viz. the illuminating as well as heating power of the current. In passing the heated wire to the bottom of a deep sinus, a clear view of the parts around is easily obtained, the occasional advantage of which may be readily understood. I have witnessed his success in a very unpromising case, by the steady and patient application of this method.

Where the loss of substance has been so considerable as to render attempts by the cautery hopeless, a flap is to be transplanted from the neighbouring parts, the edge of the opening pared, and good approximation, without making any strain on the flap, ensured by very fine harelip pins. But it is highly conducive to the success of such an operation to remove the urine by frequent catheterism. Every four or five hours a catheter should be passed, with care and gentleness, so as not to provoke irritation, and consequent frequent desires to pass water. This practice must be continued for the first six or seven days; and it is really essential to the favourable issue in most cases. The removal of the urine is thus provided for by the only way in which it can be accomplished without injury to the site of operation.

The result of the foregoing observations on fistulous openings into the male urethra warrant, I think, the following conclusions as the legitimate deductions from the data we possess:—

1. That simple urinary fistula in the scrotum or perineum, resulting from strictured urethra, does, in a large majority of cases, close and heal when the stricture has been adequately dilated.

2. That when it is necessary to treat the stricture by external division, fistulous passages should be included, if possible, in the perineal incision, when they usually heal readily and permanently.

3. That there are exceptional cases in which the result does not occur until the constitutional state of the patient is improved, and some stimulating application has been made to the sinus.

4. That a very small opening into any part of this urethra, occasioned by loss of substance, either through ulceration, sloughing, or mechanical injury, may frequently be closed by producing contraction in its parietes, by applying to them some strong chemical irritant, or the actual cautery.

5. That when there exists, anterior to the scrotum, an opening sufficiently large to admit, say, a full-sized catheter, its closure may generally be best effected by the revival of its edges, and the adaptation of a flap by displacement of the skin of the scrotum.

6. That in such case it is necessary to provide for the removal of the urine from the bladder, as far as possible, without permitting its flow through the urethra, either by maintaining a catheter there for some days, or, more effectually, by carefully passing one three or four times in the twenty-four hours, and removing it as soon as the urine is withdrawn.

7. That when an ante-scrotal opening is large, and a considerable portion of the urethra is exposed, it may be treated by the plastic operation already referred to; but the process will generally be less tedious and more complete in its results, if the urine is diverted through a small opening previously made in the perineum; the necessity for this opening increasing in proportion to the magnitude of the original one.

8. That when an opening occasioned by loss of substance exists in the perineum, which the actual cautery is inadequate to close, some plastic operation, adapted to the special circumstances of the case, may be resorted to, with fair prospects of success; provided that unremitting attention be paid to the withdrawal of the urine from the bladder without disturbing the wound, failing in which no good result can be anticipated.

CASE XXVI.

Long-standing stricture—Numerous fistulæ, which do not heal after complete dilatation—All the sinuses heal soundly after the use of caustics in the manner described.

In the end of the year 1854, I was associated with my friend Dr. James Bird, in the treatment of the case of a gentleman, whose history may be thus briefly given. He is sixty-three years of age, above thirty of which have been spent in India. Symptoms of stricture have existed more or less for about twenty years. Dilatation had been fully applied, but, after a short period of cessation from treatment, the stricture has rapidly re-appeared. Abscesses have repeatedly formed in the perineum, and the sinuses resulting have remained fistulous.

Present state.—Much emaciated; suffers from irritability of the bladder, disturbing him many times in the course of the night. The perineum is indurated in places. A fistulous opening exists on the right side anterior to the anus; another on the left, larger; and one in the mesial line, an inch anterior to the others. There is a swelling also on the right side, which threatens to break. The openings discharge pus freely, as also does the urethra. About half the urine passes by the fistulæ, and half by the natural passage, but in a slender stream. Urine deposits pus, mainly due to secretion from the sinuses; and contains albumen corresponding thereto; otherwise healthy.

I recognised a firm and narrow stricture at five inches and a half from the meatus, and, after three visits, succeeded in carrying a No. ½ catheter into the bladder, and drawing off the urine. The instrument was very tightly held, and a good deal of irritation resulted.

During the first two months of 1855, I continued the use of the catheter, gradually ascending the scale; meantime the patient's health was manifestly improving under the free use of cod-liver oil, quinine, and other tonics. Dilatation was continued slowly, for any attempt to unduly hasten the progress resulted in an attack of rigors. But notwithstanding that now No. 9, and occasionally No. 10 catheter passed with tolerable ease, the fistulæ showed no disposition to heal. A probe, armed with nitrate of silver, was then introduced into the fistulæ on several occasions, but with no permanent benefit. Meantime the swelling before mentioned had broken, and there were four fistulæ, and urine was freely discharged by them and by the urethra.

I was now disposed to think that nothing short of laying open these sinuses would be of service, and recommended the patient to submit. He, however, steadfastly declined any operative measures by the knife, earnestly requesting that we would continue to persevere in the use of any means which might afford the slightest chance of healing them. Accordingly, while maintaining dilatation, the use of the probe was continued, not only as before, but the external orifice of the fistulæ were enlarged very freely with caustic potash (see p. 359). Soon after, they began gradually to heal soundly from the bottom ; and I find by my note-book that on the 16th of April all were solidly and permanently closed. The patient then went to Brighton for change of air. I subsequently taught him to pass a No. 7 catheter for himself, which, during the summer, he continued to do once a week, without pain or trouble, thus neutralizing the tendency of the stricture to contract.

I next saw this gentleman in September, 1855, as he passed through town, from the country, on his way to India, to resume active duty there. He was then in the possession of excellent health—the scars of the former fistulæ showed them to be firmly cicatrized, and he experienced no annoyance of any kind in connection with his urinary organs. He himself passed No. 7, and I passed No. 8, into his bladder without difficulty.

CHAPTER XII.

STRICTURE OF THE FEMALE URETHRA.

Organic stricture of the female urethra very rare—Why it should be so—Anatomy of the female urethra—Length—Diameter—Mucous membrane—Dilatability—Elastic and muscular fibres—Commonest situation of stricture—Mr. Earle's case—Observations by Sir B. Brodie—Mr. Curling's case—Dr. Blundell's cases—Two cases of the Author—Causes—Laceration—Inflammation—Growths and excrescences—Treatment—Spasmodic stricture.

ORGANIC stricture of the female urethra is occasionally met with, but it is so rare an affection that the facts respecting it are very few in number. The extreme rarity of its occurrence is not difficult to account for. The passage itself is so short, as compared with that of the male, and so protected by situation from exposure to lesions of all kinds, whether occurring as a result of mechanical violence or of inflammation, that it must naturally be almost exempt from the causes which have been already shown to be the great and primary agents in the production of organic stricture in the urethra of man. Thus it is not the primary seat of gonorrhœal inflammation in the female sex, nor is it affected during a long period by the chronic form after such inflammation has been present. Nevertheless, as it does sometimes occur, I shall offer a very brief sketch of the anatomical relations of the canal, and then adduce the facts which have been ascertained respecting the affection in question.

ANATOMY.—The female urethra is a mucous canal about one inch and a half in length, lying imbedded within the tissues which form the anterior walls of the vagina, and constituting a channel for the passage of the urine outwards from the bladder. Possessing no sexual function like that of the interpelvic portion of the male urethra, it is not exactly analogous to it, wanting the peculiar formation of the prostatic part, and the ducts which open there in man. Its course describes a gentle curve, of which the concavity looks upwards and forwards as it passes from the neck of the bladder through the two layers of the deep perineal fascia, and opens beneath the pubic arch within the vulva, between the nymphæ, about an inch behind the clitoris. Its diameter varies from two to three lines at the external meatus, which is the narrowest part, to four or five lines at the neck of the bladder, towards which point it is funnel-shaped.

The mucous membrane is disposed in longitudinal plicæ, all of which, except one on the floor, are obliterated by dilatation, the latter bearing some resemblance to the verumontanum. The canal is capable of great distension, its character in this respect being widely different from that of the male urethra. Tubular mucous glands in considerable number are found at the vesical end, situated chiefly in rows between the plicæ described, while at either extremity of the canal are many small crypts into which numerous follicles enter, and these occupy chiefly its floor. Just within the external meatus there is a small depression or sinus, situated likewise in the inferior aspect.

The epithelial layer of the mucous membrane is, for the most part, composed of the stratiform variety, becoming spheroidal as it approaches the bladder. Beneath the membrane, that is, external to it, a layer of elastic fibres and of unstriped muscular fibres, intermixed, is found, continuous with the longitudinal fibres of the bladder. In connection with this, is a plexiform disposition of small vessels, chiefly venous, bearing a strong resemblance to erectile tissue. Surrounding the short division of the canal, which is posterior to the deep layer of perineal fascia, is a mass of the cellular and elastic tissues, in which are imbedded the crypts and follicles already described as existing in abundance there. An analogy to the prostate of man has been traced by some in this body. Between the two layers of fascia, there is a disposition of voluntary muscular fibres, precisely similar to that seen in the male, and described as the compressor urethræ muscles.

Situation of Stricture.—The most common situation for stricture in the female urethra, is the external orifice, or that part of the canal which is adjacent to it. Very rarely the constriction pervades the whole canal, or is confined to the posterior part of it.

Mr. Earle details an interesting case of stricture situated at two lines from the orifice, which occasioned so much distress in the performance of the urinary function, and so much pain about the part, that the presence of a calculus in the bladder was suspected. Division of this with a cutting instrument, followed by the use of bougies, afforded complete relief. He describes the obstruction as consisting of "a membranous fence of about a line and a half in thickness, beyond which the passage was quite free." The symptoms, which the patient had suffered from for years, were as follows: "continued and urgent desire to pass urine, which at times passed involuntarily, and had for some months been loaded with a thick muco-purulent secretion, a constant sense of bearing down, burning heat of the urethra, and great pain after making water, with a constant urgency to make more, immediately after she had emptied the bladder." * * * * "The sufferings gradually increased until a constant stillicidium took place."*

Sir B. Brodie states that he has seen "a few cases," and that he believes that "it is always the anterior part of the canal which is affected."† Speaking of one of these, he says, that the external orifice of the urethra was so contracted, that during life it would only admit a small probe. The patient dying of another complaint, a preparation of the parts was obtained, and the stricture appears to be situated "quite at the extremity of the urethra, occupying about half an inch of the canal."‡

Mr. Curling has on one occasion been compelled to "puncture the bladder in the direction of the canal beneath the pubes," being unable to relieve existing retention by the catheter. The stricture originated in a "contusion to which the urethra had been subjected in a protracted labour which had taken place twenty-eight years before." In this case the obstruction was situated an inch and a half from the external orifice.§

Dr. Blundell relates two cases, in which he observed contraction of the entire canal "from end to end;" in one of them there was a fistulous opening from the bladder into the vagina, by which all the urine passed. In the other no such opening existed, and the symptoms of obstruction were present; a probe only could be passed through the canal.‖

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* "Medical Gazette," vol. iii. pp. 470–1.

† Lecture in "Medical Times," vol. x. p. 460.

‡ Brodie on the "Urinary Organs," p. 91.

§ "Cyclop. Anat. and Phys." Art. Female Urethra, p. 1267.

‖ Lectures, "Lancet," vol. xv. p. 643.

I met with a single case during my residence at University College Hospital, in which retention was due to organic contraction of the meatus. The woman had suffered in a similar manner, several times, during a period of some years, and had been relieved by the introduction of small catheters, and she habitually passed a small stream with difficulty. Of late her symptoms had become worse, and she stated that on the previous occasion of retention, the instrument could not be introduced without exposure of the person. Finding this to be again necessary, after repeated attempts in the ordinary manner, it appeared on examination, impossible to discover the meatus by the eye. In the situation of the opening was a little bunch of pale, firm, corrugated, insensible excrescences, about the size of mustard seeds, or a little larger, among which, first a probe, and then a No. 1 gum catheter, were with much difficulty carried into the canal, where the latter was tightly held. After relief had been afforded, the woman was lost sight of, and not seen again. No obvious cause for the stricture had appeared on inquiry into her history.

In the spring of 1856, I had an example, at the Marylebone Infirmary, in the case of a woman, aged forty-three years, of organic stricture, affecting the anterior half of the urethra, and producing distressing symptoms. It appeared to have been occasioned by instrumental labour some years before. After relieving her, but only temporarily, by means of dilatation, carried from Nos. 1 to 5, I treated her by internal division, tying in a No. 12 afterwards. During next two months, No. 10 was passed at intervals and with ease. She was greatly improved by the treatment, but by no means cured, for at times she experienced temporary relapses without any apparent cause, in the urinary organs, adequate to produce them.

Respecting the nature of these contractions, it seems probable that most, if not all, may be attributed to two causes, viz.:—First, to those lacerations and other injuries of the canal to which, through parturition, women are occasionally liable; and, secondly, to an extension of inflammation (the gonorrhœal in particular) from the vagina to the urethra, more particularly to the crypts and follicles which have been seen to be particularly numerous and aggregated around the external meatus. In these recesses, especially, it can be readily understood that inflammation is likely to linger and remain chronic. Chancrous ulceration may also be regarded as an occasional cause; the external part of the canal being the part chiefly obnoxious to its action. A case in which narrow stricture producing retention and overflow, arose from this cause, is reported in the "Gazette des Hôpitaux," of April 6, 1846. The patient, twenty-nine years of age, applied for relief, and was treated by dilatation. She had had chancres ten years before, destroying nearly the anterior two-thirds of the canal, and by the cicatrization of which contraction was produced. From the foregoing statements, it is not difficult to understand how it is that the anterior portion of the female urethra should be the most favourite situation for the occurrence of stricture.

URETHRAL GROWTHS.—Independently of contractions properly so called, the presence of excrescences at the external meatus is not an unfrequent cause of narrowing of the canal, and of extreme difficulty and pain in making water. These growths have been recognised since the time of Morgagni, who first described them as a much more common affection of the female urethra than stricture. The form usually met with is a florid vascular tumour, something like a small raspberry in appearance, but varying from the size of a split pea to that of a small nut. It is formed of a very soft and delicate texture, is easily made to bleed, and is so exquisitely tender as to be a source of constant suffering. It generally springs from the lining membrane of the urethra, just behind the meatus, and in its earliest stage appears only in the form of a single small florid point, or there may be several such points adjacent to each other.

The resemblance which these growths possess to a florid vascular tumour before described as an occasional cause of obstruction in the urethra of the male cannot but be remarked.

Similar treatment also may be successfully followed in both instances. If the former admits it, as is generally the case, the excrescence should be snipped off close to its base, with a pair of scissors, and when the bleeding has ceased, a free application of caustic to the part should be made. This may be, according to Sir B. Brodie, either the caustic potash, or the nitric acid, indifferently, in the one case defending the neighbouring parts with an acid, in the other with an alkaline solution in the usual manner. The nitrate of silver, however, is sufficient if the growth have been properly removed, and is much more easy of application in either case.

What degree or extent of obstruction may be due at times to spasm of the compressor urethræ and other perineal muscles in the female, it is by no means easy to decide. The anomalous conditions met with in the female economy in connection with the performance of the urinary function, and usually designated hysterical, are rendered on many accounts extremely obscure in their nature and origin, and can only receive a passing notice within the limits of this work. That such involuntary contractions do occur, as in the other sex, some writers state that they have reason to believe. The principle may be at least remembered with advantage. The connection also which the state of the urinary secretion itself bears to painful and difficult micturition is to be borne in mind in relation to the subject of treatment.

As regards the management of the organic contractions, the use of dilatation, assisted, when necessary, by a division of the opposing part, as in the cases named, will generally be sufficient for their removal.

APPENDIX.

THE EXAMINATION OF URINE FOR CLINICAL PURPOSES, CHIEFLY IN CONNECTION WITH THE SUBJECT OF DIFFICULT MICTURITION.

HEALTHY URINE.

THE common, or generally prevailing characters of healthy urine may be first stated, as affording the standard of comparison by which to estimate deviations existing in any specimen submitted for examination.

Healthy urine, recently passed, is transparent; possesses an amber colour, which may be faint, pale, full, or dark, with a tint of orange-red, according to the degree of dilution in which the colouring matter exists. While fresh and warm, it has a characteristic odour, not unpleasant. After standing a few hours, a faint light cloud is seen in the liquid, occupying about the lower fourth or third of the vessel in which it stands. Its specific gravity, at 60° Fahr., may be approximately regarded as varying between 1·010 and 1·030; the mean density being from 1·018 to 1·022.

Its reaction is slightly acid, and remains so until decomposition of the organic matter contained in the liquid has commenced. Heated to ebullition its transparency remains. Mineral acids throw down no precipitates.

The quantity voided varies in different individuals, and in the same individual at different times, from the influence of season, food, exercise, &c., &c. From twenty-eight to thirty-five ounces in summer, and from thirty to forty ounces in winter may be considered as the average quantities. The solid matter contained in either case generally ranging between 600 and 700 grains in weight.

RULES FOR EXAMINATION OF URINE.

I.—The urine to be examined should be in quantity not less than two or three fluid ounces, and for the most part a portion of that which has been passed on first rising in the morning (urina sanguinis). Or a specimen of that which has been made at night (urina chyli) may be preserved also.

II.—Supposing it to be contained in a glass bottle, let the vessel be placed upright, with the cork downwards, allowing it to stand at least an hour, or two if convenient, for the purpose of permitting matters held in suspension by the urine to subside and adhere to the end of the cork; or these may be collected from any vessel with a glass pipette. But before the fluid is disturbed, let the following particulars be noted from simple inspection by the naked eye:—

The colour of the liquid.

The degree of transparency.

The characters of the deposit; such as, whether it be floating, flocculent, and scanty; ropy, viscid, and tenacious; dense, heavy, and abundant; dark or light in colour.

Its composition may frequently be predicated from this inspection alone by attention to rules hereafter given.

III.—Next, remove the cork carefully, to the under surface of which, a portion of liquid and deposit will be found adhering, sufficient in quantity for examination under the microscope. Transfer it by dabbing the wet cork upon a glass slide; immediately cover it with a piece of thin glass, and view under a good half or quarter inch object-glass. Generally speaking, I prefer the latter power, under which the accompanying illustrative drawings were made.

IV.—We may now proceed to test the bulk of the urine as follows:—

Decant it into the ordinary hydrometer glass, observing the odour, which may be fresh and normal, ammoniacal or "fishy," or fœtid.

Determine the reaction by litmus paper, which, if the urine be acid, will be turned red; the intensity of the colour corresponding with the amount of free acid present. If reddened litmus be restored to its natural colour, or turmeric paper be rendered brown, the urine is alkaline. But urine, which is acid when passed, may become alkaline by keeping, from the decomposition of the urea, and the consequent production of carbonate of ammonia. When mucus is present this change takes place with greatly increased rapidity. (See page 92.)

Take the specific gravity, bearing in mind the influence of temperature, if very accurate observations are required. For example, there is a difference of 6° in the sp. gr. of the same urine, at the two temperatures of 40° and 70° Fahr., which may be considered as representing those of winter and summer respectively. Temperature of 60° is always *understood* in all urinary reports. The specific gravity of healthy urine generally ranges between 1·010 and 1·030. If the sp. gr. be lower than 1·010 water is present in large proportion to the solid matters, a condition very commonly occurring in health.

The urine should next be examined for albumen in solution, the presence of which may be ascertained by adding nitric acid, or by applying a temperature of not less than 160° or 170° Fahr. In either case albumen is deposited in an insoluble form. The best method of applying these tests is, first, to heat a small quantity of the urine in a test-tube over the flame of a lamp, to the boiling point; if a flocculent whitish precipitate falls, it is either coagulated albumen, or an excess of earthy phosphates. Determine which, by adding a little nitric acid, which instantly dissolves the phosphates, but has no such effect on the albumen; bearing in mind that when the latter is present in very small quantity, too much nitric acid will dissolve the precipitate. But when the urine is alkaline, albumen is not precipitated by heat; in which case a small drop of nitric acid, that is, *just sufficient to faintly acidify the mixture*, should be added. For it is not sufficiently pointed out in the directions ordinarily given for the performance of this test, that the presence of free nitric acid, in the proportion of one or two per cent. in albuminous urine, will prevent coagulation taking place when heat is applied. Great care is therefore requisite to follow implicitly the rule laid down above. In all cases where the presence of albumen is suspected, the application of both heat and nitric acid is to be made, the effect of either being insufficient alone to constitute unquestionable evidence of its existence. The quantity of albumen may be approximatively determined by observing the proportion which the coagulated deposit bears to the supernatant fluid, after the test-tube and its contents have been set aside for a time.

If the sp. gr. be high, as 1·030 or more, either the presence of sugar or excess of urea may be suspected. Or the urine may in such case be only a concentrated specimen, in which the fluid constituents exist in small proportion to the solids. Diabetic urine has generally a sp. gr. of 1·030 to 1·045 or 1·050. Moore's test is a simple and efficient one for sugar. Boil the urine in a test-tube, with nearly half its bulk of pure liquor potassæ for two minutes, when, if sugar be present, the liquid acquires a brown colour of greater or less intensity. Trommer's test, and that by fermentation, should also be used as corroborative tests. The former consists in the addition of a small quantity of a solution of the sulphate of copper to the urine in a test-tube. Sufficient liquor potassæ must then be added to produce a precipitate of the oxide of copper, and to re-dissolve it. Heat until the liquid boils, when, if grape sugar be in solution, a red precipitate of the suboxide of copper is thrown down. The fermentation test it is unnecessary to detail in length, as the urinary examination which is described here is designed chiefly to apply to those conditions of the secretion which are associated with urethral obstruction and its consequences.

The presence of urea is thus determined. To a small quantity of urine in a test-tube, add half the quantity of nitric acid. Place the tube in cold water; prismatic crystals of the nitrate of urea soon appear in the fluid, if urea is present in excess. The acid gives no such result in urine of the normal composition.

If the urine be unusually high in colour, the cause may be an admixture of blood, or of bile, or an excess of purpurine.

If it be due to the presence of blood, the colour, which may vary between that of porter and the faintest tint of red, disappears on simply boiling some of the fluid in a test-tube, the contents of which at the same time become opaque, and a deposit of dark coagula will take place, proportioned in amount to the quantity of albuminous matter present. Blood corpuscles will always be seen under the microscope.

If not due to blood, wet the surface of a white plate with some of the urine to be examined, and let fall a few drops of nitric acid upon it, and if the colouring matter of bile be present, a brilliant play of colours around the acid will be instantly observed, which is transient in its duration. But if the bile be small in quantity, the appearance described will not be well exhibited unless the urine be concentrated by evaporation.

Urine coloured by purpurine gives no deposit or change of tint on being heated to the boiling point.

V.—Examination of the deposit by the naked eye.

If a dense deposit be white, yellowish, or pink, and disappear by heat, it is almost certainly urate of ammonia. Sometimes this deposit has a dark red or brown colour. The urine in any case is almost invariably acid.

If a dense white deposit do not disappear by heat, it is almost certain to be composed of the triple phosphates, in which case it will be dissolved by nitric acid, and remain unaltered by the addition of ammonia or liquor potassæ. The urine is generally neutral or alkaline.

A pink or red deposit, which is visibly granular, sandy, or crystalline, is uric acid.

If the deposit be slight and flocculent, and unchanged by nitric acid, it consists chiefly of healthy mucus and epithelium.

If a pale, opaque, homogeneous layer, easily miscible with the urine, settle to the bottom of the vessel, and the urine be acid or neutral, it is almost certainly pus. If so, albumen may be detected in the deposit by heating it, and adding nitric acid, and in the supernatant fluid also, in small quantity. Lastly, agitate an equal quantity of liquor potassæ with a portion of the deposit, and if the latter be pus, a dense gelatinous mass will result. If the deposit be more or less transparent, and gelatinous, ropy, glairy, and tenacious, perhaps containing minute air-bubbles, and is not miscible with the urine, it is probably mucus only, and the urine is generally alkaline. If the urine is acid, such a deposit is certainly mucus. But in alkaline urine, pus forms an opaque and glairy deposit. A glairy deposit may be opaque from the presence of phosphates; if so, a drop or two of nitric acid will dissolve them and render the deposit comparatively clear. The microscope will most readily decide the question, especially when the deposit is small in quantity.

Liquor puris contains albumen. Liquor muci does not.

Acetic acid has no visible effects upon an admixture of pus and urine. Added to urine containing mucus, a wrinkled membrane-like matter is seen floating through it, presenting a very characteristic appearance.

VI.—In examining the deposit under the microscope, any doubt respecting its elements will be cleared up.

Under the quarter-inch object-glass, the ordinary appearance of the deposits commonly met with are as follows:—

URIC ACID.—(Pl. III., Fig. 1.) Primary form, rhombs, of which numerous modifications are seen (*a a*); the most common exhibiting angles which are truncated or obtuse. It occurs most commonly in lozenge-shaped crystals, and rhomboidal prisms, of which the size and thickness vary greatly. Colour; usually pale amber, like that of barley-sugar, but the tints range between faint straw and deep orange-red. Sometimes in shapeless masses of cohering, prismatic, or lozenge-shaped crystals (*b b*); these are the "red sand" and "cayenne pepper" deposits which are seen by the naked eye.

URATE OF AMMONIA OR SODA generally appears as a dark amorphous deposit, which a high power shows to consist of minute particles cohering to a greater or less extent, in strings or masses. Plate III., Fig. 2 (*a a*). This is, perhaps, the most frequently occurring precipitate which is deposited from the urine. By Funke* these particles are considered to be urate of soda. Rarely it assumes the form of minute opaque balls of a reddish or reddish-yellow colour, either with or without little projecting spiculæ, which latter appear to be composed of uric acid (*b*).

Small globular masses with irregular hooked projections have been recognised as urate of soda; these are extremely rare. Fig. 2, *c*.

THE PHOSPHATE OF AMMONIA AND MAGNESIA, OR NEUTRAL TRIPLE PHOSPHATE.—(Plate III., Fig. 3.) In colourless, transparent, three-sided prisms, usually of large size, which it is not easy to mistake. The summits of these crystals exhibit great variety in the form and number of their facets. Occasionally it occurs in the stellar form, from the coherence of several small prisms, or as a rosette, where the crystals are acicular and in great number. Very rarely the neutral triple phosphate appears in double penniform crystals.

The basic form of the triple phosphate occurs in foliaceous and stelliform crystals, and is found in stale and highly alkaline urine, never in that which is acid. It appears to be a secondary formation occurring in the urine after it has been passed, and very frequently to be developed from pre-existing prismatic crystals of the neutral phosphate by gradual change. First, the prismatic crystal becomes cleft at each extremity, then slight indications of the foliaceous markings are seen diverging from near the centre to each angle, so that by degrees four branches are developed, somewhat in the form of a cross, while the angular outline of the original crystal disappears. Two new branches are frequently added afterwards, and thus the six-rayed form of this salt is produced; *a, a, a, a*, indicate these crystals in different stages of development, sketched from two specimens at different periods in the course of three days.

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* "Atlas of Physiological Chemistry." By Dr. Otto Funke. P. 22. Cavendish Society, 1853.

PHOSPHATE OF LIME occurs sometimes as a pellicle on the surface of alkaline urine, usually of minute granules: and it is often deposited with crystals of the neutral triple phosphate, adhering to them and lying free in the field. Fig. 3, *b*.

OXALATES.—Common in sharply-defined octahedral forms, colourless and transparent; of all sizes, some being exceedingly minute. (Plate III., Fig. 2, *d*.) Very rarely, indeed, in a dodecahedral form (*e*). This deposit is sometimes replaced and sometimes accompanied by small crystalline bodies, described as possessing a "dumb-bell" form (*f*). Their appearance is rare as compared with that of the octahedra. Probably their constitution is not the oxalate, but the oxalurate of lime, a closely-allied salt.

RED BLOOD CORPUSCLES.—(Plate IV., Fig. 2, *a*.) Small circular flattened discs with a faint yellowish tint; smooth, semi-transparent, and non-granular; slightly concave on each face, but plump and almost spherical in urine of low specific gravity, from endosmosis; sometimes shrivelled, with serrated edges, or burst (*b b*). The diameter is about the $\frac{1}{3500}$ of an inch in the natural flattened state, but when distended, in urine, it is somewhat less. There is no nucleus in the red corpuscle. The white blood corpuscle is larger, varying in size from the $\frac{1}{3000}$ to the $\frac{1}{2000}$ of an inch in diameter; it exhibits a tripartite nucleus on the addition of acetic acid.

PUS CORPUSCLES.—(Plate IV., Fig. 1, *a, a*.) Variable in size, generally larger than blood corpuscles; from about $\frac{1}{3000}$ to $\frac{1}{2000}$ of an inch in diameter, white, rather opaque, granular aspect externally, with two or three nuclei, sometimes four, often faintly seen, but made distinct by the addition of acetic acid (*b, b*).

MUCUS contains no specific corpuscle. Any such bodies in it are probably pus corpuscles, with which it is most frequently mixed.

EXUDATION, PLASTIC, OR COMPOUND GRANULAR CORPUSCLES; the presence of which is indicative of inflammatory action in some part of the urinary tract. Large cells from $\frac{1}{1500}$ to $\frac{1}{1000}$ of an inch in diameter, full of granules, with or without a large distinct nucleus. Seen in the urine when any degree of cystitis exists, and when chronic organic disease of the kidney is present. (Plate IV., Fig. 2, *c*, *c*.)

Epithelium; from various parts of the urinary passages; flat and spheroidal (Plate IV., Fig, 2, *d*) from the urethra; columnar (*e*) from the bladder.

Urinary Casts of the uriniferous tubes of the kidney (Plate IV., Fig. 3). Always present in chronic organic disease of the kidney, and in acute nephritis. The casts may contain epithelium only or blood corpuscles, or pus, or oil globules. Of these, the last-named appear to present indications of the most serious import.

ILLUSTRATIONS OF ORGANIC STRICTURE AND ITS CONSEQUENCES REFERRED TO IN CHAPTER II., ON THE CLASSIFICATION AND PATHOLOGY OF ORGANIC STRICTURE.

The following notes relate to preparations contained in the Museum of the Royal College of Surgeons, London. Those portions which are contained within inverted commas are quotations from the printed Catalogue.

No. 2528.—"Stricture of the urethra, two inches from the external orifice. The narrowing of the passage is produced by a mere linear constriction, beneath which there appear some fine transversely-undulating bands of glistening fibrous tissue. The submucous tissue around the stricture appears indurated and intimately connected to the tissue of the corpus spongiosum. Immediately before and behind the stricture the urethra has its natural diameter." This preparation is engraved in Hunter's work, pl. ix. fig. 1. An example of "linear stricture."

No. 2529.—"A close annular stricture of the urethra, two inches from the external orifice." Here the deeper tissues are more involved, and, consequently, the constriction does not disappear when laid open.

No. 2531.—"A close stricture of the urethra, in the anterior part of the membranous portion; indeed, the passage appears to be completely closed." It could not have been so, as no fistulæ, or other outlets, save the urethral canal, exist. (It is anterior to the membranous portion.)

No. 2534.—"Stricture near the bulb. . . . . . . The canal is irregularly contracted for above an inch in length."

No. 2535.—"Nearly the whole length of the urethra is diseased; its mucous membrane is thickened, and, in many places, contracted and puckered; with shining, wavy, fibrous bands, variously arranged in or beneath it."

No. 2536.—"Two narrow and very close strictures, one about an inch and a half, the other four inches from the external orifice of the urethra. . . . . . . The whole of the rest of the urethra is uneven and corrugated, as if by little cord-like thickenings of its walls. It presents, also, a multitude of small orifices and shallow depressions, some of which are probably dilated lacunæ."

No. 2537.—Annular stricture of the urethra near the junction of the bulb and membranous portion, with a calculus behind it, occurring in a lad six years of age. The history is given in the third volume of Home's work on Stricture, p. 55. Sir E. Home, in accounting for the occurrence of stricture in so young a lad, states that he believed it to have been caused by the irritation produced by the calculus.

No. 2539.—"An annular stricture," just anterior to the bulb.

No. 2540.—"A close annular stricture at the anterior part of the membranous part of the urethra. Immediately in front of the stricture is a small, round, deep depression in the lower wall of the urethra, produced probably by the use of instruments; and a rough, broad calculus, measuring ten lines by six, impacted behind it." (Appears to be at the junction of the spongy and membranous portions.)

No. 2541.—A narrow stricture of the urethra, about two inches from "its external orifice, and a second in the membranous portion," both irregularly contracted: (at the junction, also.) As in No. 2536, the whole canal is very uneven and corrugated.

Nos. 2542 and 2543 are cases in which extensive ulceration has occurred, chiefly at the site of the strictures, which have in this manner been completely destroyed.

Nos. 2544, 2545, 2546, 2547, 2548.—Extensive ulceration, false passages, &c. No. 2546 is engraved in Hunter's work as an example of false passage; Pl. x.

No. 2549.—"A short but very narrow stricture of the urethra, about half an inch anterior to the bulb. . . . . . . Abscesses have formed within and adjacent to the prostate gland and vesiculæ seminales. . . . . . . None of these are shown to have opened either externally or into the urethra."

No. 2550.—"A short but very narrow stricture; closure of the urethra at" (anterior to) "the junction of the bulb and membranous portion . . . . Immediately below and in front of the stricture there is a large cavity, like that of an abscess, in the tissues around the bulb and corpus spongiosum; there is no apparent communication between this and the canal of the urethra."

No. 2551.—"A small abscess in the substance of the bulb, communicating by a wide oval orifice with the urethra." Anterior to this are a contracted portion and some ulcerated spots. "A patch of lymph on the posterior part of the neck of the bladder marks the spot on which a catheter rested some days." "The patient, an old man, had a bad stricture. A catheter was introduced with difficulty, and retained in the bladder. Some progress had been made towards cure, when he was attacked with typhus fever, and died."

No. 2552.—Contraction of the spongy portion a little anterior to the junction of the bulbous and membranous parts, about an inch and a half in length. False passage; large perineal abscess.

No. 2553.—"The whole of the membranous part of the urethra is closely contracted." Fistula exists in front of the stricture. (Stricture of the membranous portion.) Referred to in Chap. II. p. 83.

No. 2554.—"A narrow annular stricture of the urethra, two and a half inches from the external orifice." The membranous portion is dilated and fasciculated.

No. 2555.—"A narrow annular stricture, nearly closing the anterior part of the membranous portion of the urethra; part of its lining membrane is ulcerated. . . . . . . Behind the stricture the membranous and prostatic portions of the urethra are dilated, and the lining membrane of the membranous portion is thickened and puckered. An inch behind the stricture is the orifice of a small fistulous canal, which opens in the perineum." (Stricture is anterior to the membranous portion.) An excellent example of the tortuous courses which urinary fistulæ often take; that exposed in the preparation cannot be less than five or six inches in length. The bladder, also, is remarkably fasciculated. Represented in Baillie's "Morbid Anatomy," Fascic. viii., pl. v. fig. 2.

No. 2557.—"The urethra, by irregular thickening of its walls, is contracted through its whole length, except in the prostatic portion, and just behind its external orifice. In these situations it is dilated. In the membranous portion, the wall of the urethra is extensively destroyed by ulceration." Besides these, fistulous passages lead to the perineum. The walls of the bladder are greatly thickened, and covered with an irregular deposit of fibrin, and with calculous matter.

No. 2558.—Stricture, abscess, and fistulæ.

No. 2559.—Stricture and fistulæ.

No. 2560.—Stricture, close to the meatus. Fistula, just behind it; and contraction for two inches behind that; the "surface fasciculated as if cicatrized." "Contraction in the membranous portion" (appears to be correctly described), with false passage just anterior to it. Bladder contracted; greatly hypertrophied; some small polypoid growths attached to the mucous membrane in some parts. Referred to in Chap. II. p. 83

No. 2566.—"Nearly all the membranous portion of the urethra is narrowed by an irregular contraction and wrinkling of its lining membrane." "Immediately in front of the stricture, a false passage has been formed by the use of caustic." This forms a cul de sac in the substance of the bulb more than an inch long, and large enough to admit a No. 15 sound.

No. 2567.—" The whole of the membranous, and part of the bulbous portion of the urethra are contracted irregularly to less than a line in diameter." (Stricture appears to be at the junction of the spongy and membranous portions.) Anterior to this the passage is " dilated to nearly twice its ordinary size, ... doubtless produced by bougies long pressed against the stricture, and parts in front of it."

Nos. 2568 to 2574, inclusive, are examples of the formation of false passages by the misuse of instruments. Some of these are also excellent illustrations of the hypertrophied condition of the bladder, which results from long-continued stricture.

No. 2576.—Ulceration, with "long, irregular, and flattened bands of lymph in the urethra." A membrane of some kind exists, formed upon the free surface of the urethral mucous membrane.

No. 2577.—" A caruncle." One of the two cases which Hunter saw and described under this name.

No. 2578.—A pyriform growth from the verumontanum of an ox, about two inches in length.

No. 1868.—Atrophy of kidney substance; dilatation of the pelvis and calices, and the ureters; the result of stricture of the urethra. Figured in Hunter's " Treatise on the Venereal Disease," and with his works; Pl. xiv.

No. 1927.—Dilatation of the ureter; the result of stricture of the urethra.

No. 1983.—An excellent example of sacculation of the mucous and cellular coats of the bladder, produced at first by protrusion between the muscular fibres. The result of stricture of the urethra.

No. 2000.—" Polypous growths from the mucous membrane of the neck of the bladder and prostatic part of the urethra. Most have narrow pedicles, and are about half an inch in length."

No. 2010.—Tubercle of the whole urinary apparatus. " Nearly the whole of the prostate has been destroyed by ulceration, and there are also tubercular deposits and ulcers in the membranous part of the urethra."

GUY'S HOSPITAL MUSEUM.

Nos. 2087^{50}, 2087^{75}, and 2089.—Fine examples of " vesical pouches," or dilatations of the lining membrane, forming large sacs. All the result of stricture in the urethra.

No. 2090.—Ulceration of the bladder, and rupture following retention.

No. 2091^{40}.—" Bladder and urethra showing effects of stricture. Bladder large, and much thickened; mucous membrane coated with false membrane, and copiously infiltrated with earthy salts."

No. 2398.—Stricture in the "membranous portion of the urethra." "A sacculus of the size and form of half a small walnut occupies each lateral lobe of the prostate, which, becoming distended with urine, for several years occasioned great impediment to micturition. The patient used to empty these pouches by pressure on the perineum. These sacculi appear to have been secondary to stricture in the urethra."

No. 2399.—Great dilatation of the urethra behind the stricture.

No. 2402^{10}.—"Stricture in the membranous portion. There is a valvular fold" just behind it. This somewhat resembles a valve in a vein, and is doubtless caused by the dilatation of a lacunæ. In the Catalogue and Inspection Book it is said to be "probably a repaired false passage."

No. 2405—Is described as an "imperforate stricture," and it has certainly the appearance of being so. There is no "Inspection Book" report in this case.

No. 2407^{50}.—Dilated bladder, and "cæcal passages in urethra." The latter are probably ducts or lacunæ largely dilated by pressure of the urine.

No. 2407^{75}—Is a fine example of dilated bladder and false passages, in connection with stricture.

No. 2409.—"Imperforate stricture, false passages, and perineal abscess. . . . . . . Small caruncles in the urethra, a little anterior to the membranous portion." Their true character is doubtful; they are very small, not unlike granulations, or nodules of lymph sometimes seen in a urethra which has been ulcerated or much inflamed behind a stricture. On referring to the records of the post-mortem examination in this case, written when the parts were recent, no allusion appears to these "caruncles." But it is stated that "the original canal of the urethra had been completely obliterated."—"1st Green Inspection Book," pp. 143-4.

No. 2410.—"Caruncles and false passage," equally doubtful with the preceding.

No. 2411.—"A large caruncle or papilliform elongation of the mucous membrane, situated a little anterior to the verumontanum. The patient had symptoms of stricture during life, which were relieved by bougies." It is polypoid in form, about nine lines long, by three or four broad, at its widest part, with a narrow pedicle. (See Fig. 4, p. 72.)

No. 2412^{9}.—Contracted bladder, with strictured urethra and *fistulous opening at the umbilicus.*

No. 2412^{20}.—"Bladder and urethra. False passages and abscess between urethra and rectum, the consequences of stricture. An attempt was made to puncture the bladder per rectum, but the trocar only passed into an abscess. Kidneys diseased. Patient died of the effects of peritonitis." The bladder in this case appears to have been pushed upwards out of reach of the trocar by an enlarged prostate and the abscess together.

No. 2412^{45}.—Bladder displaced, in a similar manner to the foregoing, by abscess behind its neck and enlarged prostate.

No. 2412^{50}.—Remarkable "hypertrophy, with contraction, of the bladder. False passages."

No. 2412^{63}.—"The urethra is obliterated for upwards of an inch anteriorly to the bulb. . . . . . . Deficiency of the canal is made up by a false passage two inches in length." On referring to the records of the post-mortem examination, it is stated that the "natural passage of the urethra was obliterated at a point anterior to the bulb."—"1st Miscellaneous Inspection Book," p. 136.

No. 2412^{90}.—Stricture. Calculi in the lacunæ of the urethra, and in pouches of the prostate. Also, very large and sacculated bladder. False passages piercing the prostate.

BARTHOLOMEW'S HOSPITAL MUSEUM.

Series xxvii. No. 10.—Fine example of sacculated bladder.

No. 28.—The bladder and urethra of a man; the former was punctured above the pubes twelve years before death; the opening remained patent during all that time, and formed the channel by which the urine passed. The "urethra is contracted throughout its whole length; a tough, fibrous band, an inch in length, and attached only by its extremities, extends from the verumontanum forwards to the membranous part of the urethra."

No. 33.—A fine example of sacculated bladder following stricture of the urethra. "On the right side are two large, thick, walled sacs, each between three and four inches in diameter, and separated from each other by a partition formed by the union of their adjacent walls. They appear to have been formed by portions of the mucous membrane, protruded like herniæ between fasciculi of the muscular coat."

Series xxix. No. 9.—Pedunculated growths from the prostate, chiefly projecting into the bladder.

Series xxx. No. 11.—A bladder, the coats of which are nearly an inch in thickness; from stricture and calculus imbedded behind it.

No. 12. "Great hypertrophy of the muscular coat of the bladder," following stricture. "Its cavity was lined throughout by a thick layer of lymph, upon which calculous matter was deposited. The coat of lymph has been separated and reflected as a continued layer."

No. 13.—Stricture anterior to the bulb. "From the bulb to the bladder the mucous membrane of the urethra is ulcerated in some situations, and in others is covered by fungous growths, with calcareous matter deposited on them: the bladder is exceedingly contracted."

No. 16.—Stricture, and ulceration of the mucous membrane at that spot, is well seen. Ulceration through the prostate also and adjacent part of the bladder, leading to a cavity in the cellular connections between the bladder and rectum.

No. 18. Annular stricture, two inches from external meatus. The entire urethra dilated behind. "From the stricture a false passage formed by catheters is continued along the side of the urethra in the corpus spongiosum, and through the prostate gland into the bladder." The passage is from six to seven inches long!

Nos. 18 and 21—Illustrate that thickening of the mucous membrane, and enlargement of the rugæ, which is often to be observed existing throughout the urethra behind a stricture.

No. 34.—The stricture itself was destroyed by ulceration, and a large opening has been formed through the surrounding parts, which is fistulous in the perineum.

No. 37.—"A penis, in which the canal of the urethra is traversed by eleven distinct cords or bands. These bands are flat and narrow, from the eighth of an inch to half an inch in length, and attached at both their extremities to the wall of the urethra. They lay close to the wall of the canal, but are now raised by portions of glass passed beneath them. They are all situated between the prostatic portions of the urethra and the part about two inches anterior to the bulb. From a man in whom instruments had been very frequently passed for the cure of stricture."

ST. GEORGE'S HOSPITAL MUSEUM.

No. S 2.—"Contraction of the urethra about three inches from the external orifice. Two transverse bridles seen at the spot."

No. S 3.—"Stricture of the urethra at two inches from the external orifice. The whole canal presents a rough appearance behind the seat of obstruction."

No. S 21.—"Urethra generally contracted, and in its membranous portion a stricture exists. The bladder itself is considerably dilated and fasciculated, and in several parts small pouches or cysts are seen in its walls. At the fundus (*apex*) one of these cysts of large size is seen, the rupture of which caused effusion of urine into the cavity of the belly, and death."

Nos. S 50, 51, and 70, are fine specimens of sacculation and dilatation of the bladder, consequent upon urethral obstruction.

No. S 52.—Stricture: much hypertrophy of bladder, and numerous sacs, into one of which the right ureter emptied itself.

No. S 78.—"Stricture of the urethra at the external orifice, followed by extensive ulceration and destruction of the greater portion of the mucous membrane of the passage, and enormous hypertrophy of the muscular structure of the bladder. The stricture was supposed to have followed a sore on the penis about two and a half years previous to his death. The patient was admitted into the hospital, July 28, 1847, very much out of health, his urine dribbling away, alkaline, and loaded with mucus and pus. He died about a month after admission. The kidneys were found much diseased and absorbed, and several abscesses existed in the perineum communicating with the urethra."

ST. THOMAS'S HOSPITAL MUSEUM.

No. BB 7.—"A polypoid growth in the bladder at the entrance of the left ureter."

No. BB 8.—"An elongated polypoid growth, attached to the upper part of the verumontanum . . . . . half an inch in length, two lines in diameter."

No. BB 9.—"Pedunculated polypi of the bladder in a child. One of these is attached close to the verumontanum, and projects upwards so as to obstruct the urethral orifice. In the prostatic portion the urethra presents a warty appearance."

No. BB 10.—Great hypertrophy of the bladder from stricture; the coats are nearly one inch in thickness. The urethra near the bulb is almost obliterated for about half an inch of its length.

No. BB 17.—An example of tubercle of the whole urinary apparatus, affecting the urethra with ulceration at the prostatic part, evidently at a period subsequently to that at which the other organs were attacked.

No. BB 19.—A similar preparation.

No. DD 3.—This preparation is No. 1743 of the old Catalogue, in which it is described as "*stricture in the prostatic portion of the urethra.*" In the new Catalogue it appears as "*stricture of the membranous part,*" to which it certainly belongs, although situated at the posterior part of it.

No. DD 4.—"Stricture in the membranous part of the urethra . . . . a large, thin, walled sacculus, measuring six inches in its vertical, and three and a half in its transverse diameter, leads from the posterior part of the bladder, with which it communicates by an aperture of the size of a shilling. A thin, imperfect layer of muscular fibres extends over the external surface of the sacculus. From a man at sixty years, who had suffered eighteen years from stricture."

No. DD 7.—Two strictures in the anterior part of the urethra. There are several transverse and longitudinal bands in the membranous part from half an inch to an inch in length, attached only at their extremities. Dilatation of the whole of the urethra behind the stricture.

No. DD 9.—Stricture. "A broad membranous band" crosses the canal in the prostatic part of the urethra. It has the appearance of being caused by an instrument.

No. DD 10.—Stricture. Membranous bands in the bulbous part of the urethra. The mucous membrane is much puckered throughout a considerable part of the spongy portion. These bands have very much the appearance of having been caused by the passage of an instrument separating from the urethral walls a fasciculus of fibres or a band of mucous membrane dividing two or more lacunæ, against which its point has caught.

No. DD 14.—Confirmed stricture, in which the dense tissue which forms it is a quarter of an inch in thickness; well shown by the section. Marked dilatation of the urethra exists behind; a commencing false passage is seen in front; abscess and perineal fistula. The prostatic part is somewhat rugose, as in most advanced cases of stricture. The bladder is much hypertrophied, and lymph is seen in patches upon its surface.

No. DD 16.—Stricture, &c. The mucous membrane of the urethra has a false membrane upon its surface, which is but slightly adherent. "Under the microscope it was found to consist entirely of epithelium."

No. DD 17.—Stricture, and rupture of the urethra behind it.

No. DD 23.—Stricture one inch from the external orifice. The whole of the canal behind is greatly dilated. It is also ulcerated, and presents a shreddy and flocculent appearance.

UNIVERSITY COLLEGE MUSEUM.

No. 782.—Two strictures in the same urethra. An excellent example of hypertrophied bladder.

No. 800.—Stricture and abscesses. Fine example of hypertrophied bladder.

No. 815.—Two strictures. Corpus spongiosum almost solidified throughout by interstitial deposit. Thick and extensive layers of lymph are attached to the surface of the mucous membrane of the bladder, and of the prostatic and membranous portions of the urethra.

No. 1063.—One of the finest specimens of sacculated bladder extant. There are two compartments of about equal size, each capable of holding from twenty to thirty fluid ounces. They are placed side by side, and communicate by a circular aperture about an inch in diameter.

No. 1228.—Three strictures in the same urethra. Dilatation between each. Fistula and fasciculated bladder.

No. 2185.—Narrow stricture of the urethra. Shreddy films of false membrane behind it.

No. 2300.—Great dilatation and sacculation of the bladder.

No. 2425.—Stricture two and a half inches from the orifice. The whole of the canal behind it is thickly coated with shreddy-looking lymph; anteriorly it is natural.

MIDDLESEX HOSPITAL MUSEUM.

No. xi. 2.—A small polypous growth from the vesical end of the prostatic portion of the urethra, rather larger than a grain of wheat. It turns backward into the bladder. There is no history.

No. xi. 7.—Dilatation and sacculation of the bladder.'

No. xi. 10.—Urethra narrowed throughout the *whole extent of the spongy portion*. In the membranous portion are marks of ulceration.

No. xi. 17.—Stricture in the membranous portion, immediately in front of which is a false passage, evidently made by instruments. It penetrates deeply the floor, and passes below the stricture.

No. xi. 27.—The glans and adjacent part of the penis removed by cancerous ulceration; the orifice of the urethra considerably contracted in consequence.

There is also a fine preparation by Sir Charles Bell, not in the Catalogue, of stricture about the junction of the spongy and membranous portions, with marked dilatation of the passage behind it; the canal here would easily admit the little finger.

Another unnumbered preparation affords a good example of the effects of fluid pressure as a result of stricture. It consists of a urethra strictured near the junction of the spongy and membranous portions; a bladder contracted behind; ureters enlarged in places to an inch or an inch and a quarter in diameter; and a dilated kidney, with much of the secreting structure gone, the sacculated cavities in which must have been capable of containing several ounces of fluid.

KING'S COLLEGE HOSPITAL MUSEUM.

Nos. 893, 894, are good examples of rupture of bladder by ulcerative destruction of the coats taking place at one point.

No. 895.—A vesical urinary fistula leading through the thyroid foramen, the result of strictured urethra.

No. 915.—An excellent example of pouches forming in connection with hypertrophied bladder. One of them is as large as a hen's egg.

No. ——.—This preparation has no number. It is an old one, and the history is lost. It is one of the best extant, as showing what amount of dilatation of the kidney and ureter may result from obstruction in any portion of the urinary apparatus. In this case it exists in the left ureter close to its entrance into the bladder, beyond and above which point the ureter is as large as the small intestine; and the sacculated and distended kidney, in which there appears to be no secreting substance remaining, is capable of holding from twenty-five to thirty ounces of fluid. Stricture of the urethra seems to have co-existed.

No. 931.—Urethra greatly dilated behind the stricture, which is in the middle of the spongy portion.

IN THE LONDON HOSPITAL MUSEUM—

Among several preparations of stricture—one only need be noticed here.

E. d. 47.—A sacculated bladder, stated to be the result of stricture of the urethra, in which the pouch formed is, as nearly as possible, of the same size as the bladder itself; the only apparent distinction between them being the thinness of the coats forming the sac as compared with those forming the original viscus. The aperture between the two cavities is so small that an ordinary goosequill would fill it.

EDINBURGH ROYAL COLLEGE OF SURGEONS' MUSEUM.*

No. 1992, xxxi. F.—" Fine example of the effect of stricture of the urethra on the ureter, by which it and the infundibula have been greatly dilated."

Nos. 1975 and 1978, xxxi. F. are similar, but less advanced cases. B.

No. 2020, xxxi. G.—" Bladder of a *woman*, æt. 39, ulcerated and ruptured. The urethra is seen to be strictured. The cellular tissue between the peritoneum and abdominal muscles was filled with urine." The stricture is a narrow one; the bladder hypertrophied. B.

No. 2050, xxxii. A.—" Sacculated bladder; the sac of equal size with the bladder itself, and communicates by a hole of an inch diameter. From stricture in the urethra." B.

No. 2054, xxxii. B.—" Bladder which had suffered much distension in consequence of stricture in the urethra. Two remarkable pouches project from it. The diameter of one these is four inches." B.

No. 2079, xxxii. C.—" Large abscess in the prostate. The patient had long suffered from stricture. The irritation of the bougie produced abscess between the rectum and the bladder, which burst into the cavity of the abdomen." This is exceedingly well seen. B.

No. 2093, xxxii. D.—" A very narrow stricture of the orifice of the urethra. Large abscesses formed round the root of the penis and the lower part of the belly in consequence of the stricture." B.

No. 2096, xxxii. D.—" Frænulum, or bridle stricture of the urethra." B.

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* The fine collection of Sir Charles Bell became the property of the Royal College of Edinburgh. All the preparations noted here, excepting four (beside many others), were his, and are described in his "Treatise on the Diseases of the Urethra," and many of them were engraved in his "Engravings from Specimens of Morbid Parts." London, 1813. They are distinguished by the letter B., placed *after* the description.

No. 2096, a.—"The bougie which was cut by the frænulum of last preparation." The end of the instrument is forked, by pressure against the frænulum. B.

No. 2108, xxxii. D.—"Urethra universally affected with thickening and contraction. The canal is at one point so narrow that only a bristle can be passed through the stricture." B.

No. 2109.—A similar preparation. B.

No. 2110, xxxii. E.—"A narrow stricture at the anterior part of the caput gallinaginis." Engraved in the "Morbid Anatomy of the Urethra." (Pl. iv., Fig. 3.) This is a narrow, well-marked stricture, situated in the membranous, and not in the prostatic portion, as a superficial observer might conclude. The white line of the verumontanum can be readily traced passing through it along the membranous portion. The prostatic part behind the stricture, which is dilated, measures an inch and a half in length. B.

No. 2114, xxxii. E.—"Stricture with ulcerated surface; the callosity extending to the surrounding spongy substance of the urethra." This latter is exceedingly well shown. Sir C. Bell, who figured this specimen in his "Morbid Anatomy," says:—"It would have been impossible to have destroyed this stricture with caustic." Bell's "Treatise on the Urethra," 3rd edition, p. 383.

No. 2120, xxxii. E.—"Cancerous ulceration of the orifice of the urethra, producing stricture." Means *chancrous;* and is so described in Bell's work, 3rd edition, p. 385. B.

No. 2130, xxxii. E.—Case in which a small calculus lodged behind a stricture, and produced complete obstruction. Abundant deposit of lymph upon the mucous membrane of the urethra behind the stricture and in the bladder, from inflammation. B.

No. 2132, xxxii. F.—"Urethra having two bridle strictures and several caruncles and warts in the sinus." B.

No. 2133, xxxii. F.—"Cast of the above." The caruncles, &c., are very small in the former preparation, but the cast indicates that they have probably become smaller since immersion in spirit. B.

No. 2135, xxxii. F.—Narrow stricture. "The urethra behind it is very much dilated, and has numerous bands running across it." B.

No. 2136, xxxii. F.—"A bridle stricture at the membranous part." B.

No. 2137, xxxii. F.—"Urethra with an extensive false passage (four inches long). It is "lined with a membrane scarcely distinguishable from that of the urethra itself."

No. 2139, xxxii. F.—"Stricture so complete that a bristle cannot be passed through it." False passage exists. This description is in Sir Charles Bell's own words. See his work, p. 404. B.

No. 2144, xxxii. F.—"Stricture of the urethra, with ulceration and passage of the urine into the scrotum. The urethra is dilated into a pouch behind the stricture; in it there is a cord of organized lymph, and the prostate is converted into two hollow bags." Sacculation of the bladder also.

No. 2159, xxxii. G.—"A very narrow stricture an inch from the glans. All the urethra posterior to it is very much dilated, the lower part of the passage obstructed by filaments running across it, and the enlargements of the ducts of the prostate." B.

These two cases exemplify remarks made (pp. 52 and 66) respecting the formation of free bands sometimes observed.

No. 2160, xxxii. G.—Bladder and urethra of a patient brought into Middlesex Hospital, having the scrotum and penis distended with urine. He died with extensive sloughing of the parts. The bladder, of which the inner surface is disorganized, contained only pus. Abscess in the prostate, and in the spongy body, at the bulb. "The stricture is exactly like a *velum* spread across the canal of the urethra; the smallest bristle cannot be passed through it." B.

This preparation appears to be an example of a valvular fold produced by a dilated lacuna.

TABLE OF CASES ANALYSED AT PAGE 124.

Of the following 220 cases, the first 143 are taken from the unpublished records in the Case-books of University College Hospital.

The next 28, viz. from Nos. 144 to 171, inclusive, are chiefly private cases, and also unpublished, but include in addition, a few others which have come prominently beneath the writer's immediate notice, in the practice of others.

The last 49, viz. from Nos. 172 to 220 inclusive, are the most carefully reported cases which have appeared in the public journals, and contain the required particulars.

UNPUBLISHED CASES FROM THE CASE-BOOKS OF UNIVERSITY COLLEGE HOSPITAL.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
1. C. H.	42	Gonorrhœa at 17 years of age, lasting some months.	Stream of urine first observed to diminish in size 15 years after. Retention usually occurs after exposure to wet and drinking to excess.	Stricture rather narrow.
2. J. D.	25	Gon. four years ago. Very chronic.	Stream of urine first observed to diminish in size three years after. Retention occurs when he catches cold.	Stricture rather narrow.
3. J. H.	45	Gon. once, a few years ago.	Stream first observed to diminish one year after. Retention first occurred two years after.	A very narrow stricture. Urine passes only by drops.
4. R. N.	31	Gon. at 16 and at 24 years.	Stream first observed to diminish after last attack. First retention four years after. Occurs when exposed to sudden changes of temperature.	Stricture rather narrow.
5. J. W.	67	Gon. several times, syphilis also. None since 34 years of age.	Stream of urine has been small for "many years." Never had retention.	Stricture rather narrow. Renal disease of some standing.
6. J. M.	49	Gon. 13 years ago, apparently soon cured.	Six months after, felt soreness and pain in the perineum when making water. Soon after, the stream became notably smaller.	Stricture rather narrow.
7. C. H.	25	Gon. several times.	Symptoms of stricture commenced three years ago.	Stricture.
8. L. B.	66	Gon. several times; syphilis also.	Felt pain and difficulty in making water 25 years after last attack. Retention four years after this.	A narrow stricture.
9. D. M'G.	69	Never gon. Is subject to attacks of spasmodic asthma.	Stream of urine has been observed to diminish in size during nine years past. Retention occurs frequently.	Very slight degree of contraction habitually.
10. J. P.	32	Never gon. Injury to the urethra by a blow on the perineum.		An unyielding stricture. Abscess and perineal fistula.
11. W. P.	28	Severe gon. at 20 years; habits very intemperate. Discharge chronic and neglected.	Stream diminished in size, and micturition became painful, within 15 months of the attack. Retention has occurred two or three times within last two years.	A narrow stricture.
12. J. D.	45	Severe gonorrhœa and chordee at 28 years; again at 30; habits intemperate; much exposed to wet and cold. Discharge chronic.	Difficulty in passing water first observed eight years after last attack. Retention first occurred one year afterwards.	Narrow stricture.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
13. J. K.	47	Violent blow on the perineum by a fall from the rigging on board ship, when 41 years of age.	Two years afterwards retention occurred after drinking a quantity of beer. An instrument was passed with much force, and much hæmorrhage followed. Retention frequent since.	A very obstinate stricture.
14. T. A.	28	A violent blow on the perineum at 21 years of age.	Stream of urine gradually diminished during four or five years following the accident. Then retention first occurred.	A very narrow stricture, through which an instrument is never passed. Pressure by its point against the stricture affords relief during retention.
15. T. S.	30	Gon. at 23 years old. Discharge continued for a long time after.	Stream first observed to diminish about one year after; retention was the first symptom occurring, before a year had expired, after cold and excess of drink.	A narrow stricture.
16. J. D.	16	Gon. a month ago.		Inflammatory stricture causing retention.
17. J. D.	36	A fall injuring the perineum.	Symptoms of stricture appeared almost immediately after the accident.	A narrow and obstinate stricture, three months and a half after.
18. J. W.	36	Gon. at 34 years; intemperate. Discharge has never ceased.	Stream first observed to diminish one year and a half ago: retention has occurred frequently during the last year, after drinking or exposure to cold.	Stricture.
19. D. G.	26	Gon. at 20 years. Soon cured.	Symptoms of stricture appeared in less than two months after.	A narrow stricture with perineal abscess and urethro-rectal fistula.
20. G. B.	27	Gon. six or seven times; last attack nine months ago.	Stream of urine is usually of tolerable size, but varies much and frequently; retention has occurred three times during the last three months.	Stricture.
21. C. M.	43	Gon. many times; syphilis; intemperate; has resided in the East Indies. Never free from some urethral discharge.	Stream first observed to diminish 18 years ago; abscesses in the perineum have formed several times during the last 15 years.	Urethra strictured at two or three points; two fistulæ.
22. J. W.	50	Gon. 20 years ago.	Stream first observed to diminish about two or three years ago; pain in passing water for some time.	Three or four strictures. No. 1 catheter passed with difficulty.
23. J. R.	68	Gon. several times; last attack very severe, two years ago.	Stream first observed to diminish about nine years ago.	A narrow stricture, and retention with overflow.
24. T. S.	30	Gon. several times. Chronic.	Symptoms of stricture appeared about nine years ago.	Stricture and gon.
25. G. F. S.	54	Injury from the pommel of a saddle while riding, 32 years ago.		A narrow stricture and perineal fistulæ.
26. D. H.	41	Gon. 17 years ago. Very chronic.	Retention seven years after, which was the first symptom of stricture; it frequently recurs.	A narrow stricture.
27. F. J. M.	17	A blow on the perineum at eight years of age.	Stream of urine has been observed to diminish ever since.	A narrow stricture; fistulæ; retention.
28. H. G.	23	Gon. and severe chordee a year and a half ago. Discharge chronic.	Stream observed to become smaller in about four or five weeks after.	A narrow stricture; passes his urine by drops; retention with overflow, of ten months' standing.
29. G. S.	43	Gon. several times between the 18th and 22nd year. Seldom free from discharge.	Difficulty in passing water was observed soon after last attack; retention several times within last 15 years.	Stricture, but not very narrow.
30. H. S.	23	Gon. at 19; again at 22 years. Last attack very obstinate.	Difficulty in passing water for six months past; size of stream varies.	A very narrow stricture.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
31. G. K.	32	Gon. 10 years ago. Rather chronic.	Stream observed to pass less freely than usual within two months after.	A narrow stricture; retention.
32. J. P.	25	Gon. about 6 months ago with severe chordee. Discharge has continued until now.	Stream observed to become smaller about three months ago.	Retention occurring immediately after complete and sudden cessation of the discharge.
33. D. B.	33	Gon. 12 years ago, for which he received much treatment.	Stream observed to become smaller eight years ago.	An exceedingly narrow and obstinate stricture.
34. J. F.	36	Gon. twice about seven or eight years ago.	Stream observed to become a little smaller soon after.	Stricture; abscesses in the perineum.
35. J. B.	63	Gon. much neglected about 24 years ago. Very chronic.	Symptoms of stricture appeared about four years after; occasional retention on exposure to cold.	Stricture and abscesses in the perineum.
36. H. H.	50	A severe blow on the perineum while riding a restive horse, followed by hæmorrhage from the urethra seven years ago.	Stricture immediately followed, improved by dilatation; no treatment for last two years; has gradually become worse since.	A very narrow and obstinate stricture; perineal abscesses.
37. J. L.	41	Gon. 20 years ago.	Symptoms of stricture first noticed about three years after; retention several times since; first attack 14 years ago.	A narrow stricture; extravasation of urine; abscesses in perineum.
38. C. P.	23	Blow on perineum two months ago, followed by retention of urine.		A narrow stricture already.
39. E. S.	40	Gon. 17 years ago, and syphilis.	Symptoms of stricture first observed three or four years after.	Stricture and retention for the first time, after drinking to excess.
40. J. B.	35	Gon. three or four times within last 10 years. Very chronic, and never received any treatment.	Stream passed with difficulty six years ago; first attack of retention two years ago; has frequently recurred since.	Stricture.
41. J. H.	33	Gon. 15 years ago. Lasting six months.	Stream observed to become smaller one year after.	Stricture and incontinence.
42. L. H.	29	Gon. seven or eight years ago; habits very intemperate. First attack very chronic.	Stream observed to become smaller about a year and a half ago; retention frequently since.	Stricture and retention.
43. M. P.	27	Gon. five years ago; much exposed to cold and wet. More or less discharge ever since.	Retention several times within last two or three years.	Stricture and retention.
44. T. S.	36	Gon. about six months ago.	Discharge suddenly stopped; symptoms of stricture followed in a day or two, and have persisted ever since.	Stricture not very considerable.
45. J. H.	37	Gon. about 16 years ago. Lasting 12 months.	Symptoms of stricture observed about nine months after cessation of the discharge; retention several times since.	Stricture and albuminuria.
46. E. B.	40	Gon. three times; last attack 15 years ago. Gleet long continued.	Symptoms of stricture appeared about a year after the last attack; retention many times during last 10 years.	Very obstinate stricture; fistula in perineo; has been treated in almost every hospital in London.
47. W. M.	40	Gon. four or five times.	Symptoms of stricture first observed about four or five years ago.	Stricture.
48. F. G.	23	Fall across a beam, followed by hæmorrhage from urethra and retention of urine, about a year and a half ago.	Symptoms of stricture soon followed.	A narrow stricture; general health much affected.
49. J. B.	26	Gon. six years ago. Lasting some months.	Stream observed to become small some years back; micturition difficult for 12 months past.	A narrow stricture; urine passes by drops.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
50. W. S.	40	Gon. and chancres nine years ago.	Occasional obstruction to micturition seven years ago.	Narrow stricture and perineal abscesses.
51. W. F.	42	Gon. 24 years ago; again about a year after. Last attack chronic.	Thinks he has never passed water so freely since last attack; retention 17 years ago, recurring when he catches cold.	Stricture and retention.
52. R. L.	34	Gon. five times; last attack two years ago.	Retention a month after last attack of gonorrhœa; has recurred frequently since; usually after excess in drinking.	Stricture and retention.
53. W. R.	48	Gon. three times; last attack four years ago. Gleet ever since.		A very unyielding stricture with urinary fistulæ.
54. J. H.	44	Gon. 15 years ago. Discharge very chronic.	Symptoms of stricture observed about six months afterwards; retention ten years ago, following violent exercise.	A narrow stricture.
55. D. B.	37	Gon. "many years ago."	About ten years after, went to West Indies, where he found difficulty in making water, for the first time, which has increased since; perineal abscess seven years ago.	Narrow stricture; extravasation of urine; abscesses in perineum and above pubes.
56. J. W.	42	Severe blow on the perineum; hæmorrhage from the urethra after. Apparently soon recovered.	Stream began to grow smaller not long after; retention three years after, following excess in drink.	Stricture and retention.
57. J. W.	63	Gon. and chancres 37 years ago; extremely careless in his habits. Always some discharge.	Was treated for stricture more than 23 years ago; abscesses in perineum soon after.	Stricture, fistulæ, and renal disease.
58. R. T.	43	Gon. 12 years ago, neglected. Discharge continued two or three years.	Symptoms of stricture first observed during that period.	Stricture, syphilis, cachexia, albuminuria.
59. H. S.	61	Severe gon. and chancres at 20 years; habits very intemperate.	Stream observed to become smaller a year or two ago, and retention has occurred two or three times within the same period.	Stricture and retention; albuminuria.
60. J. M.	42	Gon. several times since 20 years old; intemperate. Some discharge from the urethra almost always present.	Symptoms of stricture have existed for ten years past; retention several times.	Narrow stricture; retention and perineal abscesses.
61. R. M.	40	Severe gon. and phymosis at 21; residence for some years since in the West Indies.	No symptom of stricture until 17 years after, when sudden retention came on after drinking beer and taking much exercise.	A narrow stricture; general health much impaired.
62. J. P.	47	Gon. 10 years ago; second attack seven years ago. Urethral discharge ever since last attack, increased by exposure to cold.	Difficulty in passing water during last six years.	A very narrow stricture; urine passes by drops and involuntarily.
63. W. B.	49	Gon. 15 years ago. Discharge continued for year and half afterwards.	Difficulty in passing water of 14 years' duration; occasional attacks of retention.	Stricture and retention.
64. H. D.	38	Gon. three or four times; last attack 12 years ago. Ever since last attack has suffered some pain in the urethra, and from trifling hæmorrhage.	Symptoms of stricture during five or six years; retention several times.	Two strictures, perineal and recto-vesical fistulæ.
65. C. —	49	Gon. when young. Discharge almost constant, increased by excess in drink.	Stream first observed to become smaller about six years ago, when retention followed a debauch.	Stricture.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
66. J. Q.	33	Gon. at 20 years. Discharge soon ceased.	Stream first observed to become smaller within a month; retention, after drinking, in a year's time.	Very narrow stricture perineal fistulæ, scrotal ditto, through which all the urine passes.
67. H. P.	24	Gon. four or five years ago. Discharge lasting 12 months.	Abscess and inflammation nine months after; fistula, through which the urine passed; after it had healed, symptoms of stricture began to appear.	Stricture, not very narrow.
68. A. R.	32	Gon. several times; last attack three weeks since. Discharge soon ceased.		Retention, after drinking, from inflammatory stricture.
69. C. S.	58.	Severe gon. with phymosis, at 17 years. Discharge chronic.	Stream has been smaller than natural ever since; gradually worse of late.	Stricture and retention.
70. J. D.	58	Last attack of gon. six years ago. Soon cured.	Symptoms of stricture first observed one year ago.	Stricture.
71. J. R.	38	Severe gon. 16 years ago; neglected. Discharge continued many months.	Stream observed to become smaller soon after.	Narrow stricture and retention.
72. J. T.	48	Gon. two or three times; last attack 16 years ago.	Stream observed to become smaller after last attack.	Narrow and obstinate stricture.
73. J. W.	56	Gon. at 16, never since; takes much horse exercise, but has not received any injury in the perineum that he is aware of.	Difficulty in passing water first observed about 12 months ago.	Narrow stricture; urine passes only by drops.
74. J. W.	55	Last attack of gon. 16 years ago; attributed to the use of strong injections.	Difficulty in making water appeared within a month after the attack.	Stricture which has been repeatedly dilated; renal disease.
75. R. C.	22	Severe gon. two years ago.	More or less difficulty in passing water since, especially after drinking or exposure to cold.	Stricture not very narrow; retention for the first time.
76. W. K.	84	Repeated attacks of cystitis from the age of 14, without appreciable cause; gon. at 20 years.	Symptoms of stricture first observed about the age of 34; perineal section four years ago; fistula since, through which the urine passes.	A very narrow stricture; perineal fistula and abscesses.
77. J. B.	39	Gon. and chancres 13 years ago. Discharge chronic.	Stream observed to become smaller soon after.	Very narrow stricture; retention.
78. J. C.	13	A blow on the perineum two years ago followed by hæmorrhage.	Partial incontinence a week after, continuing more or less ever since.	Stricture, nephritis, and death.
79. T. H.	66	Gon. at 20 years and at 26. Discharge chronic.	Stream began to diminish as the discharge decreased; treatment at intervals in several hospitals since.	Narrow and unyielding stricture; false passages; urine passes by drops.
80. J. M.	56	Gon. at 21, and chancres; again at 34; severe chordee.	Stream began to grow smaller soon after the last attack; retention not long after; much treatment at different times.	Narrow stricture and perineal fistulæ.
81. J. D.	15	Blow on the perineum three months ago, followed by retention of urine.	Stream has become smaller ever since.	A very narrow stricture; urine passes by drops.
82. J. C.	30	Three attacks of gon. within six years. More or less discharge ever since.	Stream has become smaller since the second attack; retention first occurred three years and a half ago.	Narrow stricture.
83. H. W.	28	Gon. with chordee, nine years ago. Lasting 12 months.	Retention eight years ago, frequently recurring since; after this a blow on the perineum and hæmorrhage.	A narrow stricture.
84. J. G.	54	Gon. several times; last attack seven years ago. Neglected and very chronic.	Stream observed to become smaller as the discharge from last attack ceased; retention three years ago; perineal abscess one year ago.	Two or three strictures; fistulæ in perineum; albuminuria.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
85. J. A.	27	Gon. six or seven years ago.	Stream observed to become smaller as the discharge ceased.	Stricture not narrow, but liable to become so from drinking or exposure to cold.
86. E. B.		Gon. five times.	Stream observed to become smaller after the second attack, 12 years ago; became worse after each subsequent attack.	Narrow stricture; urine passes by drops; perineal abscess.
87. S. B.	46	Gon. at 21.	Stream observed to become smaller a year after; gradually diminished during 10 years.	Narrow stricture; albuminuria, with general health very much affected.
88. J. A.	38	Gon. several times between 20 and 30 years.	Stream observed to become smaller nine or 10 years ago.	Narrow stricture; disease of the renal organs.
89. J. W.	47	Gon. eight years ago. Lasting some months.	Stream observed to become smaller soon after; incontinence at night for some time past.	A narrow and obstinate stricture; water passes by drops.
90. P. H.	62	Gon. and chancres 30 years ago. Discharge continuing for many months.	Symptoms of stricture first observed 20 years ago; first attack of retention four years ago; several since.	A narrow stricture; retention; perineal abscesses.
91. R. O.	28	Gon. and chancres about a year ago; much horse-exercise shortly after.	Symptoms of stricture soon followed, with abscess and fistula.	A narrow stricture, fistula in perineo; gon.
92. J. S.	39	Gon. five years ago. Gleet lasting nearly 12 months.	Unusually frequent micturition in two months after; then narrowing of the stream; irritability of bladder occurs after drinking or exposure to cold.	Stricture not very narrow; incontinence.
93. J. L.	23	Gon. year and half ago; Again about a month ago.	Complete retention a fortnight ago; recurred a few days after.	Retention for the third time, relieved by No. 8 catheter; urethral discharge; no organic stricture appreciable during after treatment.
94. J. F.	51	Severe gon. at 24 years; chordee, orchitis, &c. Gleet for some time after.		Stricture of long standing, not very narrow; urine albuminous.
95. J. P.	52	Severe gon. 18 years ago. Discharge never entirely ceased.	Stream has gradually become smaller ever since.	A narrow stricture; retention; abscess in perineum.
96. C. M.	28	Gon. many times; habits very intemperate. Rarely without some discharge from the urethra.	Retention first occurred between six and seven years ago: repeated attacks, and narrowing of the stream since.	Very narrow and obstinate stricture.
97. B. S.	30	Gon. four years ago.	Symptoms of stricture first observed three years ago.	A narrow stricture; retention following prolonged debauch and exposure to cold.
98. C. W.	27	Gon. two or three years ago; again five months ago, and chancres.	States that he has been unable to "retain his urine above an hour or two since the first attack."	Stricture and irritable bladder.
99. T. C.	44	Gon. and chancres 25 years ago; habits intemperate; much exposed to cold.	Did not observe the stream of urine to be smaller than natural until six months ago; abscess in perineum.	Narrow stricture and incontinence.
100. W. W.	46	Gon. at 18 years, lasting nine months. More or less discharge has continued ever since.	Difficulty in passing water first observed about eight years ago; since that time instruments have been rudely applied.	Narrow stricture; hæmorrhoids; irritable bladder.
101. G. B.	52	Unusually severe gon. when young, orchitis, &c.; residence in India.	13 years ago retention occurred, relieved by catheter; the stream of urine continued of the natural size until lately, when it began to narrow rapidly.	Narrow stricture; abscess and fistula in perineo.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
102. J. S.	62	Never had gon.; much exposed to wet and cold; subject to attacks of dyspnœa.	10 years ago an attack of retention, without any cause that the patient can assign; retention frequent of late.	Stricture not very narrow; retention.
103. J. D.	30	Gon. repeatedly within the last 10 years; chancres; urethritis much increased by horse-exercise. Discharge, in some quantity, always present.		Two narrow strictures; irritable bladder and urethra.
104. J. P.	61	A violent blow from the pommel of a saddle while riding, soon relieved from immediate effects by treatment.	After which stream slowly diminished in size; retention has frequently occurred after drinking.	A narrow stricture; perineal abscesses; extravasation of urine; perforation of bladder and death.
105. C. T.	64	Severe gon. when young. Gleet long continued.	Stream observed to become smaller soon after; improved by dilatation; some years after, symptoms return with each attack of gout, to which he is subject.	Stricture varying much in condition at different periods.
106. W. B.	27	Gon. seven years ago. Continuing for a long period.	Symptoms of stricture observed rather more than three years ago; retention has occurred since under circumstances of mental excitement, and unconnected with drinking.	A narrow stricture; retention.
107. G. S.	27	Gon. three years ago. Soon cured.	Difficulty in passing water occurred with the cessation of the discharge; increased at all times by drinking.	A stricture not very narrow; retention.
108. W. W.	68	Gon. frequently when young.	Stricture of 42 years' duration; stream varies much in size.	Stricture not very narrow; renal disease.
109. C. B.	65	Gon. when young. Soon cured.	Difficult micturition followed almost immediately; retention occurred first 10 years ago, relieved by operation in the perineum; fistula.	Stricture and renal disease.
110. E. C.	31	Gon. nine years ago. Very intemperate. Gleet has continued to the present time.	Stream observed to become smaller of late.	Stricture; retention; perineal abscess; extravasation of urine.
111. H. E.	35	Gon. 15 years ago; twice during last four years.	Stream observed to become smaller since last attack.	Stricture and retention.
112. R. S.	41	Gon. nine years ago; urethral discharge recurs after drinking to excess; very intemperate.	Retention first occurred after drinking to excess three years ago; stream observed to become smaller since; retention several times.	Stricture not very narrow; retention.
113. G. C.	30	Gon. some years ago; much exposed to wet and cold.	Retention has followed exposure to cold and wet; instruments have been passed with much force.	Stricture.
114. J. W.	63	Gon. "nearly thirty years ago."	"No difficulty in making water until about two years ago; much deposit in the urine at that time; stream has become smaller ever since."	Stricture; retention; extravasation, and death.
115. R. D.	40	Gon. many years ago;	Symptoms of stricture first observed five years ago; always aggravated by indisposition of any kind.	Stricture; retention; perineal abscess.
116. T. H.	52	In India, 17 years ago, his horse fell upon him, and retention of urine followed. Four years of good health followed recovery from this accident.	Retention first followed exposure to wet and cold in this country; symptoms of stricture now appeared; much treatment and little improvement.	Narrow and obstinate stricture; general health bad.
117. W. J.	61	Gon. 30 years ago; intemperate; much exposed to cold and wet. Gleet remained two or three years.	Stream observed to become smaller soon after; retention has occurred occasionally.	A long and narrow stricture; renal disease; large calculus in the bladder; death.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
118. J. B.	28	Gon. nine years ago.	First treated for stricture two years ago.	Narrow stricture; urinary abscesses; death.
119. J. A.	39	Asserts that he never had gonorrhœa (?) seven years ago suffered much scalding in micturition, for which he can assign no cause.	Difficulty in passing water followed this.	A stricture, but by no means narrow.
120. J. E.	40	States that he never made so large a stream when a boy as others do; gon. 20 years ago.	Increased difficulty in micturition for 12 years past; experiences a return of the discharge whenever he drinks freely, or is exposed to wet or cold.	Stricture; retention.
121. G. R.	43	Gon. six years ago.	Stream has been observed to become smaller ever since; retention first occurred two years ago.	Stricture and retention.
122. J. B.	45	Gon. 13 years ago.	Retention has occurred whenever he drinks to excess, during the last six years.	Stricture and retention.
123. T. C.	52	Gon. twice; last attack about 25 years ago.	Stream observed to become smaller about 15 years ago; three years ago retention and perineal section, since which the stream has again diminished.	No. 3 passes now, but with difficulty.
124. E. F.		Gon. several times.	Symptoms of stricture first appeared about 20 years ago, which increase considerably when the urine is acid.	Stricture not very narrow; retention.
125. H. B.	39	Gon. 14 years ago; urethral discharge frequently brought about on slight irritations. More or less discharge from the urethra is usually present.	Symptoms of stricture first observed about three years ago.	Stricture not very narnow.
126. J. W. S.	44	Gon. at 18. Discharge has never altogether ceased.	Symptoms of stricture appeared soon after the gon.; retention has occurred two or three times since.	Stricture and retention.
127 C. H.	48	Gon. 25 years ago.	Symptoms of stricture appeared for a short time 10 years ago, but disappeared; three years ago became worse, after straining at work.	Narrow stricture and retention.
128. S. K.	34	Gon. five years ago. Lasting three months.	Symptoms first appeared one year and a half ago.	Stricture rather narrow.
129. P. G.	64	Gon. several times; last attack at 40 years of age.	Symptoms of stricture appeared with the last attack of gonorrhœa; have gradually become worse of late.	Very narrow stricture.
130. W. R.	52	Chancres about the glands twice; congenital epispadias.	Stream of urine diminished after last attack; abscess in the perineum recently.	Meatus exceedingly narrow from cicatrization of the chancres; urine passes only by drops; fistula in perineum.
131. C. T.	38	Gon. three or four times about 12 or 15 years ago.	Stream of urine observed to become smaller about ten years ago; abscess in perineum, and retention four years ago.	Narrow stricture.
132. B. W.	26	Gon. twice; two years since last attack. Gleet followed.	Difficulty in passing water observed about six months ago, after drinking and exposure to cold; stream smaller ever since.	Stricture.
133. W. O.	20	Gon. and chancres one year and a half ago; habits exceedingly bad. Discharge never ceased.	Stream of urine had become very small 12 months after.	Very narrow stricture; water dribbles away involuntarily; extensive disease of the kidneys, and death.
134. R. T.	48	Never had gon.	Stream of urine becomes smaller in cold and damp weather.	Narrowing of urethra, from congestion or subacute inflammation; perineal abscess.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
135. S. H.		Injury to perineum twice within two years.	Stream soon observed to become smaller after the first injury.	Intractable stricture.
136. W. J.	35	Gon. many years ago; and again two months ago.		Inflammatory stricture and retention.
137. G. T.	53	Syphilitic ulceration destroying great part of the penis 20 years ago.		Stricture at orifice, and also in posterior part of urethra; abscesses and fistulæ; the first named being impassable, perineal section was performed.
138. J. C.	33	Gon. six weeks ago.		Stricture and perineal abscess.
139. W. C.	24	Gon. two or three times; last attack six months ago. Discharge chronic.	Inflammation re-induced by sexual connection.	Inflammatory stricture.
140. G. L.	68	Many years ago had gon.	Stream became very small during and after the attack, but resumed its natural size.	Temporary stricture and retention after drinking.
141. G. H.	35	Gon. about 13 years ago. From which he quite recovered.	An attack of retention six years ago; cause unknown; repeated attacks since, after excess in drink, &c.	Slight organic stricture; spasm and inflammation supervening cause retention.
142. G. H.	32	Gon. about 14 years ago.	Stream of urine first observed to become smaller about seven years ago.	Stricture, retention, extravasation, and death.
143. W. W.	52	Several attacks of gon. in early life; a sailor, and much exposed to cold. Attacks neglected, and of long duration.	Symptoms of stricture appeared in a few years; first retention, 17 years ago; much treatment at different times; fistula in perineo, which has since healed.	Two narrow obstinate strictures; water passes by drops.

CASES WHICH HAVE OCCURRED IN THE AUTHOR'S PRACTICE, OR WHICH HAVE COME BENEATH HIS NOTICE IN THE PRACTICE OF OTHERS.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
144. A. B.	19	Laceration and division of the urethra by injury when a child.	Has passed all the urine by fistula in the perineum ever since.	Complete obliteration of the canal, and fistula in the perineum.
145. W. D.	49	Gon. four or five times when young: the last attack 20 years ago. Some discharge from the urethra ever since.	Retention nine years ago, succeeding prolonged efforts (voluntary) to retain his urine, since which the stream has become smaller.	Two or three strictures; one very narrow.
146. E. M.	18	No injury or other cause that can be ascertained.	Stricture has existed ever since he was eight years old; retention occurring every three or four months; of late it has often followed drinking freely of beer.	Stricture, but not narrow; obstinate retention.
147. E. J.	23	Gon. six months ago; very intemperate. Gleet since.	Stream has been observed to grow smaller of late.	Retention following debauch; stricture not narrow.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
148. M. M.	60	Gon.; last time 20 years ago: Which continued some months.	Stream has been decreasing in size since, varying at times.	A narrow and obstinate stricture; retention.
149. J. T.	49	Gon. 25 years ago. Very chronic.	Retention was the first symptom observed, occurring after transition from very hot to a very cold temperature; has recurred since.	Narrow and obstinate stricture.
150. H. H.	37	Nine years ago was crushed against a wall by some horses; ill for succeeding three months.	His water has passed with more or less difficulty ever since; occasional retention; incontinence of late.	Very narrow stricture; urinary organs greatly diseased; death.
151. J. B.	27	Gon. five or six times between the age of 18 and 24, when in the East Indies. Discharge very chronic.	Stream first observed to be a little smaller than usual about two years after.	A stricture, not narrow.
152. C. H.	49	Gon. at 16; slight urethral discharge at times since; frequent but not severe; very intemperate. Chronic and neglected.	Stream of urine first observed to become smaller six years ago; retention several times after drinking immoderately.	Narrow and obstinate stricture.
153. R. E.	44	Last attack of gon. at 40 years of age. Gleet after.	Symptoms of stricture observed three years ago.	Stricture not very narrow.
154. G. W.	54	Gon. when young, and again at the age of 41. The discharge never entirely ceased after last attack.	Symptoms of stricture first observed about 10 years ago.	Stricture not very narnow; perineal fistula.
155. C.T.B.	26	Exposure to cold after severe exercise; recent gon. apparently almost well.		Inflammatory stricture suddenly induced, causing retention.
156. A. J.	53	Never gon.; acid urine; gouty diathesis.		Considerable narrowing of the stream of urine, lasting for some time.
157. C. W.	29	Gon. four or five times. Discharge has been chronic and neglected.	Thinks the stream of urine diminished in size very soon after the last attack.	Stricture in two places; not very narrow.
158. W. M.	37	Gon. three times—once with chancres. Last attack eight years ago, followed by gleet.	About 12 months after, the stream became smaller also; is more so at times than others.	Stricture rather narrow; urethra irritable and tender.
159. T. B.	26	Gon. several times. Discharge constant.	Narrowing of the stream about three years ago; retention 12 months ago.	Stricture.
160. P. O.	48	Never gon.; acid urine, gout, and rheumatism. Urethral discharge occasionally.	After exposure to cold the stream becomes narrower.	Stricture about six inches from the orifice; irritable urethra.
161. G.M'K.	24	Gon. once; stream smaller than natural ever since he can remember; irritable bladder.	Immediately after gon. the stream narrowed and symptoms became worse.	Narrow stricture.
162. C. Y.	36	Gon. at 20; again two years ago; much on horseback. Last attack chronic.	Symptoms worse after riding; stream has grown smaller during last two or three months.	Stricture.
163. B. J.	40	Gon. three or four times; last attack ten years ago; drinks freely. Chronic.	Stricture of seven years' standing; treatment several times; retention twice.	Narrow and irritable stricture.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
164. D. J.	32	Gon. twice six years ago; four years ago "riding on the bare back," was suddenly seized with pain, and lost blood from the urethra.	Stream observed to become smaller some time after; has had instruments passed since, but with difficulty.	Narrow stricture.
165. J. J. T.	36	Gon. two or three times. Discharge has existed for a long time.	Stream smaller, and unusual difficulty in passing water for the last two or three years.	Stricture not very narrow.
166. G. F.	29	Gon. only once, three years ago. Neglected and chronic	Urine passes in a divided stream; much pain in hypogastrium and loins for some time past.	Narrowing of the urethra, not considerable, about an inch from the meatus.
167. T. P	23	Fell through the staves of a ladder when at work; some hæmorrhage from the urethra followed.	Within two months passed urine in a small stream.	Stricture, not very narrow.
168. T. G.	30	Gon. three times; last attack three years ago. Has had discharge ever since.	Stream of urine became smaller very soon after last attack; the difficulty has since increased.	A narrow stricture.
169. H. K.	58	Gon. once, when young; several times lately he has observed a little urethral discharge, without any cause that he is aware of.	Urine alkaline; general health much depressed of late; sometimes the urine passes with much straining.	Slight stricture at the bulb; urethra irritable; digestive organs much out of order.
170. W. J.	26	Gon. three times; last attack two years since. Some discharge lasting six months, never wholly subsiding.	For 12 months past there has been some difficulty in passing water; pains about loins at times, and in the urethra.	Stricture not narrow but extremely irritable.
171. C. B.	41	Gon. several times; habits very irregular. Discharge frequently occurs, and has been neglected.	Has had stricture for seven years, more or less; retention three years ago.	Stricture rather narrow; swelling in perineum.

FULLY REPORTED CASES FROM THE MEDICAL JOURNALS.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
172. W. K.	43	Injuries to the perineum 13 years ago.	Stricture ever since; his urine has passed, for 12 years past, entirely through fistulous openings in the scrotum.	Narrow stricture; fistulæ.
173. W. B.	60	Never had gon.; subject to hæmorrhoids for 20 years.	Difficulty in making water has existed for 12 years; first retention a year ago	Stricture and retention.
174. W. D.			Never recollects to have passed water in a full stream.	A narrow stricture at the meatus externus, presumed to be congenital.
175. G. B.	28	Gon. six years ago.	Difficulty in passing urine soon followed.	Stricture.
176. ——.	61	Gon. 16 years ago. Discharge never ceased.	Difficulty in passing water for last two years.	Stricture and retention.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
177. S. S.	42	Severe gon. 15 years ago. Gleet following, lasted some years.	Difficulty in passing urine for many years.	Stricture and retention.
178. — C.	49	Gon. 10 or 11 times. Last attack was followed by a profuse and chronic discharge.	Stricture has existed for several years.	Stricture and retention.
179. W. L.	55	Gon. many years ago.	Difficulty in micturition only commenced four years ago.	Stricture, abscess, and retention.
180. ——.	36	Gon. at 19. Discharge more or less for 10 years.	Symptoms of stricture appeared at its cessation.	Stricture and retention.
181. W. R.	38	Blow on the perineum 10 years ago, followed by hæmorrhage.	Difficult micturition soon followed; incontinence for five or six years.	Stricture and fistulæ.
182. H. J.	34	Violent blow on the perineum 6 months ago, followed by hæmorrhage.	Difficult micturition soon followed.	Narrow stricture.
183. A. B.	50	Gon. 20 years ago.	Narrowing of the stream a few months after; catheterism more or less ever since.	Stricture; urine passes only by drops.
184. S. N.	31	Two years ago, had chancres; one at the external meatus.	Cicatrix followed at the meatus, which gradually contracting, caused difficulty in micturition.	Stricture and perineal abscess.
185. B. M.	32	Gon. five years ago. Quickly cured.	Symptoms of stricture appeared very soon after.	Stricture and retention for the first time; death from rupture of the bladder.
186. M. D.	33	Gon. four months ago. Used strong injections of sulphate of copper, which gave much pain.	Difficult micturition soon after; increasing since.	Stricture.
187. J. W.	42	Gon. twice; four years ago, a fall from an omnibus, followed by bloody urine,	Difficult micturition soon followed; retention frequently occurs, especially after drinking.	Stricture.
188. R. P.	46	Gon. 14 years ago.	Stream observed to become smaller soon after.	Stricture, fistulæ, perineal section, and death; disease of the kidneys.
189. S. E.	42	Gon. repeatedly.	Stream passed with difficulty 12 years ago.	Stricture and retention; numerous perineal abscesses.
190. J. M.	48	Gon. 30 years ago, not since.	Stream observed to become smaller 10 years ago, without any assignable cause.	Stricture, retention, and incontinence.
191. E. G.	59	Gon. three times. Last attack of long duration.	Stream observed to diminish 15 months after last attack; retention occurs after excess of any kind.	A very narrow and obstinate stricture.
192. ——.	52	Gon. three times.	Stream passed with difficulty about 12 months after last attack; irritable bladder; retention and extravasation.	Very narrow stricture and perineal fistula.
193. ——.	36	Made a smaller stream than natural in childhood, and much incontinence then: slight gon. 10 years ago.	Difficulty in micturition greatly increased since gonorrhœa; retention a year ago; incontinence since.	A catheter cannot be passed; perineal section and death.
194. J. S.	43	A punctured wound in the perineum at 13 years of age, through which the urine passed.	Wound healed in three months; soon after the stream became smaller, the wound re-opened, and fistula remained.	A narrow stricture, and calculus vesicæ.
195. G. M.	26	Gon. Very chronic.		Stricture of three years' standing.
196. T. S.	30	Gon.; very intemperate. Chronic and aggravated by horse-exercise.		Narrow stricture, from the effects of which the constitution has suffered.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
197. J. W.		Gon. 25 years ago.	Soon after, was exposed greatly to wet and cold; three weeks after had difficulty in passing water, gradually increasing since.	Stricture; extravasation of urine.
198. W. P.	44	Gon. at 19. Gleet following for a year.	Symptoms of stricture observed six years after.	Narrow stricture.
199. G. B.	24	Gon. nine months ago.	Stream observed to become smaller, since discharge has ceased.	Narrow stricture; urine passes by drops.
200. J. W.	Midd. Age.	Gon. 16 years ago; stream of urine smaller than natural since childhood. Severe and long continued.	Symptoms of stricture soon followed the gonorrhœa.	Very narrow stricture; extravasation of urine.
201. R. B.	30	Gon. two years ago: difficulty in passing water then, which soon subsided; gon. again three weeks ago.		Complete retention from inflammatory obstruction, occurring at about three inches from the orifice.
202. J. M.	25	Gon. several times; last attack year and half ago. Lasting four months.	After which first observed difficulty in making water.	A narrow stricture; extravasation of urine.
203. L. S.	40	Severe gon. three years ago.	Stream has become smaller by degrees since.	A narrow stricture; urine passes only by drops.
204. — W.	47	Gon. 20 years ago; strong injections used.	Symptoms of stricture observed about two years after; much treatment.	A narrow stricture; urine passes only by drops.
205. — C.	53	Gon. at 21. Very chronic and followed by gleet.	Stream became smaller soon after.	Three strictures in the canal.
206. T. H.	50	Injury to the perineum while learning to ride in a cavalry regiment, at 19 years of age.	Some difficulty in micturition followed; repeated gon. since have aggravated the symptoms; much treatment.	Two or three very narrow strictures; urine passes by drops.
207. T. C.	32	Fall on the perineum on board ship two years ago.	A small stream since, and occasional retention.	Very narrow stricture; incontinence; general health bad.
208. — R.	47	Gon. badly treated in youth. Chronic.	Symptoms of stricture appeared 19 years ago; retention two years after.	Two strictures; general health much impaired.
209. M. D.	29	Gon. several times between 18 and 25.	Stream became smaller soon after last attack, and very soon passed only by drops.	Two narrow strictures
210. ——.	37	Tape-worm in the intestines.		Producing spasmodic stricture, all symptoms of which disappeared after its expulsion; referred to p. 138.
211. ——.		Urethritis following an over-dose of nitrate of potash. Chronic.		Obstinate stricture.
212. J. W.	45	Gon. four times many years ago. Discharge lasting 12 months after last attack.	Symptoms of stricture appeared about 15 years ago.	Very narrow and obstinate stricture.
213. J. H.	52	A kick on the perineum four years ago, followed by retention.	Treatment for stricture ever since.	Impassable stricture.
214. J. L.	43	Gon. 25 years ago.	Symptoms of stricture first observed about five years after; attacks of retention during last seven years.	Impassable stricture and fistula.
215. A. B.	25	Blow on the perineum two years ago, with much pain.	Retention a month after.	Impassable stricture. abdominal and perineal fistulæ, and calculus vesicæ.

Patients' initials.	Age.	Antecedents and Supposed Causes.	Access and Progress of the Disease.	Present Condition.
216. H. L.	24	A sack of flour fell on him when seven years old, forcibly bending his trunk on his thighs: retention immediate.	Urine has never passed freely since; retention about eight years after from violent cold; a kick five months ago made him worse.	Stricture and retention.
217. A. C.	26	A large angular fragment of stone impacted in the membranous part of the urethra after lithotomy, where it remained a few days; afterwards, it passed back into the bladder.	Stricture discovered within six weeks after, which would not admit the passage of a catheter.	In another week the operation of perineal section was performed, the stricture being impermeable by the smallest sound.
218. M. N.		Chancres on the prepuce and at the meatus externus.		Three months afterwards the orifice was diminished to one-third of its original size, and division of the cicatrix was performed.
219. F. C.	27	Severe urethral discharge brought on five years ago by masturbation; never had sexual intercourse. Subsequent attacks brought on by exertion.	Gradual diminution of the stream.	A narrow stricture, discovered after death at the anterior limit of the prostatic portion of the urethra. [Lallemand.]
220. A. B.	27	Severe gon. 12 years ago; chordee, during which the penis received a heavy blow; hæmorrhage followed.	Three months after an abscess in the front of the scrotum.	Stricture followed at the site of the abscess.

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